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AN impression is gained from the literature that the larynx is the organ of voice, and that it has been evolved to subserve this function. I suggest that this view is erroneous, and that its use for purposes of voice is only a subsidiary one of several functions. In examining the larynx in various types of animals one is impressed by the fact that there is no marked relation between the structure of the organ and the vocal powers of its possessor. Vocal cords similar to those of man are to be seen in many animals which are naturally silent, as in most bears, whilst there is a complete absence of vocal cords as we usually picture them in many habitually noisy species such as the domestic cow. Many instances might be given, but the point needs a special study of its own.

To investigate the functions and mechanism of the larynx we must approach the subject with an open mind, and trace the evolution of the organ from its most primitive beginnings; later on we can examine each secondary modification as it appears, and see what relation it has to the habits of the individual, without blurring our perception by concentrating attention solely on the habit of phonation.

EVOLUTION OF THE LARYNX.

In the dipnoi, or lung fish, there is a mechanism developed to ensure survival of the individual when the water of the river in which it lives has dried up. This mechanism takes the form of lungs, morphologically comparable to those of mammals. The pulmonary outgrowth springs from the ventral wall of the fore-gut, and at its orifice a sphincteric band of muscle is developed to keep it closed at all times except when air is passing through; food and water are thereby prevented from entering. A primitive larynx thus comes into existence, with the primitive function of closing the air tract.

To compare this process of the evolution of a simple larynx (Fig. I.) with what occurs in human embryology, we derive information from the work of Prof. J. E. S. Frazer in particular. The pulmonary outgrowth appears in the floor of the fore-gut in the third week; the actual boundaries of the primitive sagittal fissure are derived from the sixth visceral arches. At first the fissure lies flat in the pharyngeal floor, just as it does in the lung fish, but the further processes of development carry it beyond this simple stage, and it is found that at no time is there merely a sphincteric band of muscle present to close its orifice; for many modifications creep in in relation to varied functions that must be carried out, each one of which will be studied in its correct place.

Origin of Arytenoid Cartilages.—As air is forced into the lungs by contractions of the pharynx in Dipnoi, and as the call for air is slight, passive dilatation of the glottis is all that is required; but as the demand for air increases, so some mechanism for active opening has to be evolved. This mechanism is seen in the form of simple dilator muscle fibres in Protopterus, one of the Dipnoi. But these simple fibres are not so efficient as the dilator fibres of the iris of the eye, for instance, and so we find that in Sirens and Axolotl a lateral cartilage has made its appearance on either side of the trachea, and to its pointed extremity the dilator fibres gain attachment. These cartilages serve to maintain patency of the air tube, and in some Salamanders and all higher forms the tips are separated off by muscle action, and appear as arytenoid cartilages, whilst the lower parts fuse together and form a primitive cricoid ring. The primary function of the arytenoids is for opening, and not for closing the glottis, for the latter action can be done efficiently by the sphincteric muscle. In the human embryo the margins of the glottis, made up of the sixth arches, are found to grow rapidly, and become known as the lateral masses. By a condensation of mesenchyme cells in them there appear the nuclei of the arytenoid and cricoid cartilages; the latter arises in two centres, which subsequently coalesce, in just the same way as the previously separated lateral plates are seen to fuse in animals above the level of Axolotl. At no time, however, are the arytenoid and cricoid cartilages continuous, although they arise from contiguous collections of cells.

Thyroid Cartilage.—In the ventral ends of one or more pairs of visceral arches are developed cartilaginous elements, which will form the thyroid cartilage; in some low forms, such as Echidna, these bars are fused both to the hyoid system and to the cricoid, and help to complete the scaffolding of the larynx.

In the human being the thyroid cartilage is developed in the ventral end of the fourth arch only; only at an early time is it fused either to the hyoid or cricoid elements. Both dilator and sphincteric muscles gain attachments to the cricoid. The sphincter muscle also takes origin from the thyroid element; its continuity at its ventral extremity then becomes interrupted, so that it takes the form of a horse-shoe instead of that of a complete circle.

In such low types as the Alligator the sphincteric muscle wraps round, but is not inserted into the arytenoid, but in higher forms it gains attachment to the cartilage at what becomes the muscular process. The muscle is thus split into five elements—namely, thyro-arytenoideus and crico-arytenoideus lateralis on either side, and inter-arytenoideus in the position of the posterior or dorsal commissure.

Thyro-Arytenoid Fold.—The primitive lateral cartilage is very long, but does not extend quite to the cephalic end of the margins of the glottis, and the forward portion of the boundary of the fissure remains as a membranous fold; this represents the thyro-arytenoid fold, and it is of vital importance, in that it is capable of allowing separation of the tips of the lateral or arytenoid cartilages by virtue of its elasticity. In the human embryo the formation of the thyro-arytenoid fold is complicated by the early formation of a ventricle at the end of the second month; the process can be traced, however, as a condensation of cells in the mesenchyme of the lateral mass, resulting in the formation of what is known as the chordal nodule. Strands of cells run from the latter to the thyroid, cricoid, and arytenoid cartilages, and by stretching out of this tissue between the thyroid and arytenoid there is developed that part of the thyro-arytenoid fold which is known as the vocal cord.

The Definitive Larynx.—In its simple form the larynx consists of cricoid, thyroid, and arytenoid cartilages, and thyro-arytenoid folds, with sphincteric and dilator muscles of varying degrees of complexity; as such it is seen in most reptiles and birds. There are no epiglottis or ary-epiglottic folds, and no separation of thyro-arytenoid fold into true cords and ventricular bands. In endeavouring to discover what part of the complicated human larynx represents the primitive organ as we have thus described it, we rely on the observations of Prof. Frazer. He states that a line drawn back along the true cord, and then upwards along the border of the arytenoid eminence to the inter-arytenoid notch, corresponds with the margin of the original sagittal opening in the pharyngeal floor; this part represents roughly the simple larynx as we have described it. All the parts above this line, such as the ary-epiglottic folds, the cartilages of Wrisberg and Santorini, the major part of the epiglottis, and the ventricular bands, are derived from the general pharyngeal cavity, and not from the pulmonary outgrowth. They are modifications designed to subserve functions we have yet to study, and are parts superadded to the primitive

organ; furthermore, by their appearance, the original function of the margins of the glottis, which is to act as a valve for the protection of the air tract against entrance of substances other than air, has been relegated to more recently added structures.

Modification in Shape of Primitive Glottis.—For the efficient carrying out of its primary function of preventing the entrance of food and water into the pulmonary apparatus, it is interesting to notice a change in the shape of part of the simple larynx, which appears in amphibians, reptiles, and birds, and is repeated in the case of many mammals. The configuration is found to be such that the margins of the glottis, when in apposition, present a surface which is convex and dome-shaped above, and concave and vaulted below. The margins of the glottis—made up of the arytenoid cartilages and thyro-arytenoid folds—take on this shape because it is necessary that they should be able to withstand a considerable pressure of water present in the pharynx, and to prevent its entrance into the lungs. At the same time it is not desirable that they should obstruct the exit of air from the trachea.

As a result of this peculiar shape, when the pressure of water—and incidentally that of air—becomes increased on the pharyngeal surface of this laryngeal valve, the margins are the more firmly pressed together. As a consequence, there is relegated to the sphincteric muscle the simple rôle of bringing the margins into apposition, after which closure is more or less automatically maintained; as the pressure rises, so the coaptation of the margins becomes more intimate. When it is desired, however, that air should enter the trachea, the dome-shaped glottic margins must be separated by abductor muscle action, and in consequence the latter muscles attain a greatly enhanced importance in this valvular type of larynx, in comparison to that which they possess in the more simple organ of Protopterus.

The dome-shaped modification of the larynx thus confers a mechanical advantage as long as the abductor muscles are efficient, but at the same time it leads to the danger of prevention of entrance of air into the lungs if the dilator mechanism breaks down.

We conclude, then, that the simple type of larynx so far described is a valve designed to guard the entrance of the pulmonary air tract against the entrance of substances other than air; it is modified so as to be able to open actively while respiration is proceeding. The many other functions it takes on, such as those subserving olfaction, circulation, phonation, and so on, are thrust upon it in higher forms, but are not those for which it was developed in the more lowly types of animals.

FIG. I.

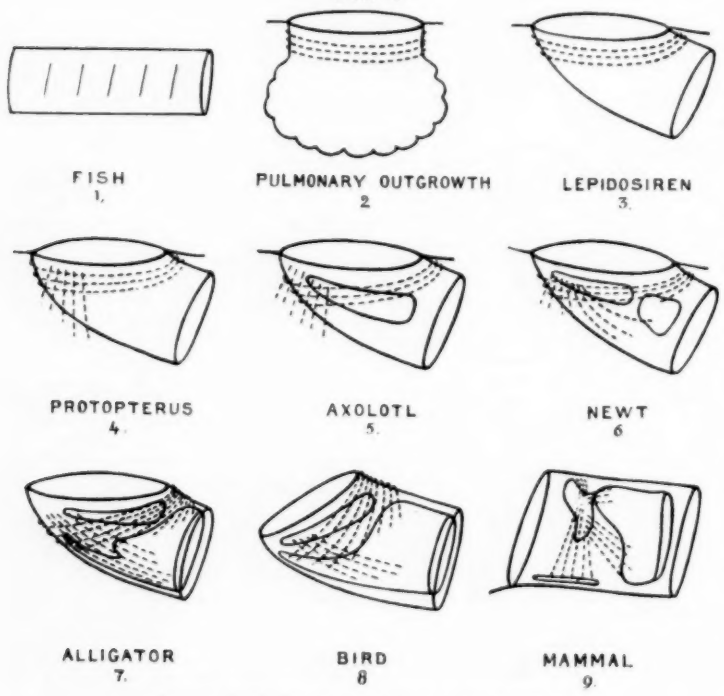


Diagram illustrating the evolution of the larynx.

MODIFICATIONS FOR PURPOSES OF OLFACTION.

Mr. R. H. Burne has given a comprehensive description of the olfactory organ of teleostean fishes (Fig. II.), and has described the mechanism by which water is made to circulate over the olfactory rosette. There is found to be no communication of this simple nose with the food tract in the majority of fish; in Dipnoi, however, such a communication exists. In these fishes inspiration is effected by the swallowing of air through the mouth, as occurs also in some Salamanders and Newts. While the air-breathing proceeded there would therefore be no circulation of air through the nose, and the olfactory sense would not be acute; therefore a communication, or choana, is present in the roof of the mouth, whereby air can be made to pass over the olfactory rosette, so as to give off sufficient odour for perception of scent. There is no necessity for air to pass through the nose, as far as respiration is concerned, in these cold-blooded animals.

In reptiles the mouth does not have to be kept open for chewing, and there are various mechanisms to ensure nasal breathing; in mammals which rely on the olfactory sense to warn them of enemies and poisonous foodstuffs, some mechanism has to be provided to ensure that a current of air shall pass through the nose while the animal is eating with its mouth open.

Primitive Function of Epiglottis.—The epiglottis has this function of shutting off the air tract from the mouth, in association with the soft palate; its primitive function, therefore, is one of olfaction, although it has subsequently taken on other duties. Man has not a keen olfactory sense and his epiglottis is somewhat degenerated; similarly we can see that in microsmatic animals such as Sea Lions, some Cetaceans, and Monkeys, the epiglottis is comparatively small, whilst in the macrosmatic Dogs, Cats, Deer, and so on, it is big and efficient.

In the human fœtus the pulmonary outgrowth appears at about the fifteenth day, and the olfactory pit at the twenty-first. The bucco-nasal membrane breaks down at about the thirty-fifth, and the palate is only completed by about the forty-ninth day. These facts illustrate the probable sequence of events in the evolution of nasal breathing, and indicate that the latter is a secondary modification of respiration.

MODIFICATIONS FOR PURPOSES OF RESPIRATION.

In a Lizard the choana opens on the roof of the pharynx at a right angle, and the glottis opens from the floor of the pharynx in such a way that the air stream has to turn at two more right angles, one from pharynx into larynx, and a second one from the latter into the trachea. Furthermore, there

is a wide interval between the choana and the glottis.

Straightening of Air Tract.—There can be traced various stages in which these bends in the air tract have been straightened out, and a good example is seen in many deer and antelopes. (Fig. III.) In them the nostril opens in the axis in which the head is held when running; the nose is wide and straight; the naso-pharynx, with the help of the soft palate, is wide, straight, and extremely long, and opens at the level of the larynx. The latter is brought into apposition with the nasal tube by means of the pharyngeal walls behind and at the sides, whilst in front the passage is made continuous by means of the epiglottis and soft palate; the former lies above the soft palate in the intra-narial position. The aperture of the glottis is tilted, and is at right angles to the axis of the pharynx, and does not lie flat in the pharyngeal floor as it does in most reptiles; consequently there is now no angle between the larynx and the trachea. Air is enabled to pass practically in a straight line from nostril to lung.

Air Tract in Man.—In man the needs of respiration are not so great, and the air tract is not so straight. The anterior nostril opens at right angles to the long axis of the head, and the nasal passage is tortuous; the soft palate is short and the epiglottis is small, so that the larynx is never intra-narial, not even, as far as I have been able to discover, in the fœtus examined in situ in the uterus. (Fig. IV.)

FIG. II.

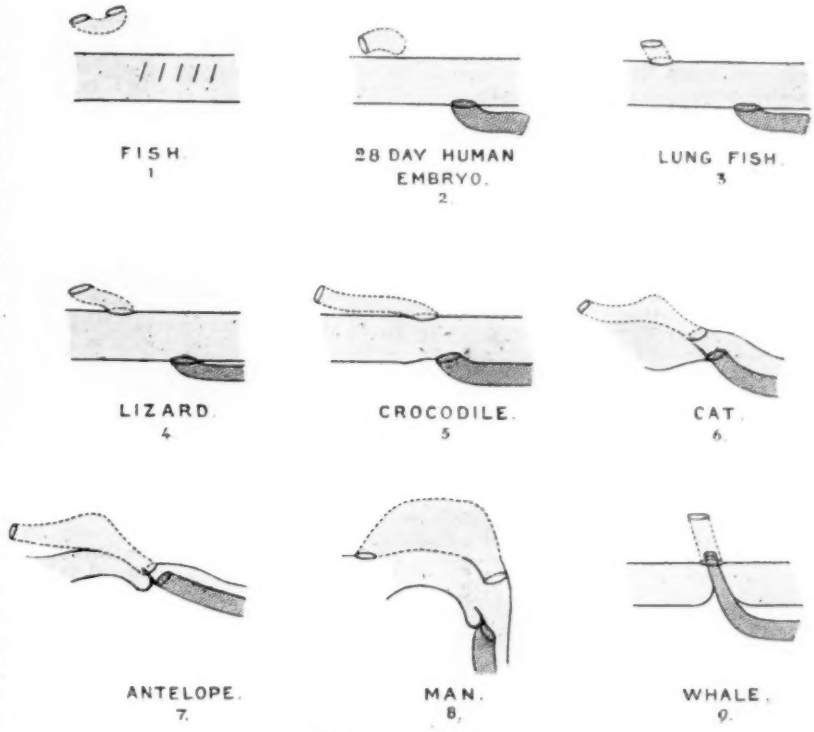


Diagram illustrating modification of larynx in relation to olfaction.
Darkest stippling = pulmonary air tract. Lightest stippling = food tract.
Medium stippling = nasal passage.

The axis of the glottis is in line with that of the trachea, and the mechanism of this change of inclination comes about in early fœtal life through overgrowth of the lateral masses, as compared with that of the central mass, which is a formation lying between the ventral ends of the third and fourth arches. The whole larynx of man drops in the neck from early fœtal life onwards because of four reasons. First, there is no necessity for its apposition to the nasal tube for purposes of olfaction or respiration; second, there is a big tongue in a short muzzle; third, because of changes in the vertebro-basal and pituitary angles as compared with lower types; and fourth, because of downward growth of the face.

In the child mouth-breathing is difficult because of lack of habit and the marked development of the tongue for purposes of suckling; in the adult it is frequently resorted to, although with detriment, because of deficient warming of the air.

Length of Arytenoids.—We have already seen that arytenoid cartilages were evolved in order to open the glottis during the passage of air. In most reptiles the cartilages are very long, but in the higher mammals and in man there are many variations in length, the reason for which must be sought for. As the aperture of the glottis lies flat, or at most only slightly tilted, in the pharyngeal floor of most Fishes, Amphibians, Reptiles, and Birds, so it is possible for the cross-section of the air-way to be increased to an indefinite extent by simple lengthening of the fissure. The glottis when open in these animals is of a triangular shape, the sides very long, and the base very short, and if the sides are long enough, a very big sectional area will be available for the passage of air.

In the case of those animals, however, which have a larynx in which the aperture of the glottis is tilted to a degree approaching a right angle—a modification for diminishing friction of air—indefinite lengthening of the margins of the glottis is impossible, because a laryngeal aperture of this type would not allow deglutition to proceed, if placed transversely in the pharynx. Therefore the glottis is found to be less slit-like in mammals, and to approach more nearly to a broad and short shape when open.

The optimum length for the arytenoids by mathematical calculation is approximately seven-tenths of the diameter of the larynx; at this length the greatest possible sectional area is obtained for the passage of air, and any variation either above or below seven-tenths decreases the available air-way. The extremely fast-running Persian gazelle shows a length of arytenoid 6·9, as compared to a laryngeal diameter of 10; this is very near the optimum, and gives a sectional area which we shall call 49.

Man has need of long valvular thyro-arytenoid folds, otherwise known as vocal cords; consequently he could not have long arytenoids unless his larynx were greatly increased in size, and he is limited in pace thereby. In his case the length is as 4·5 and the sectional area 39. A sloth is still worse off, and has a length of 3·6 and an area of 29. These calculations only show the relative degree to which the larynx can open in each case, and do not give the actual area available for the passage of air, because we have not taken into account the size of the larynx. If we compare the actual cross-section available for air when the glottis is widely open, we find these facts in the case of a man and a horse; the former

has a speed compared to the latter roughly as 1 : 2·4, whilst the ratio of the available air-way for each pound of body-weight is approximately 1 : 2·3.

This does not show exactly how much air can pass in either case, but it shows that a man has a poor provision for rapid oxygenation of his tissues in comparison with a fast-running quadruped; so it is evident that in spite of a body otherwise well designed for running, the human individual is at a disadvantage because of the choke at the narrowest part of his air-way—namely, the glottis.

Variations in Size of Larynx.—In some fast-running animals, such as wolves and dogs, there are long and well-formed vocal cords, while the arytenoid cartilages are not so long in comparison to the diameter of the larynx as they are in the case of antelopes. This would produce choking at the glottis were it not for the fact that the larynx itself is very big in comparison to the size of the trachea; the aperture of the glottis is thus large and allows the passage of a volume of air sufficient to carry on respiratory exchange at the high level demanded by the rapid metabolic rate of the animal.

Accessory Aids to Respiration.—It is possible that the laryngeal saccule in man represents a degenerate relic of a mechanism for helping in respiration, by means of which partly used air can be expelled from the lungs, mixed, and forced in again to yield up more oxygen. The saccule appears to me to correspond morphologically and functionally to the air sacs of the higher Apes, and functionally to those of some Seals and Frogs, but the subject needs a separate study by itself.

Respiratory Movements of Glottis.—The primitive larynx is closed except when air is passing; the larynx in higher mammals is open except when food is passing. The movements in man at inspiration

FIG. III.

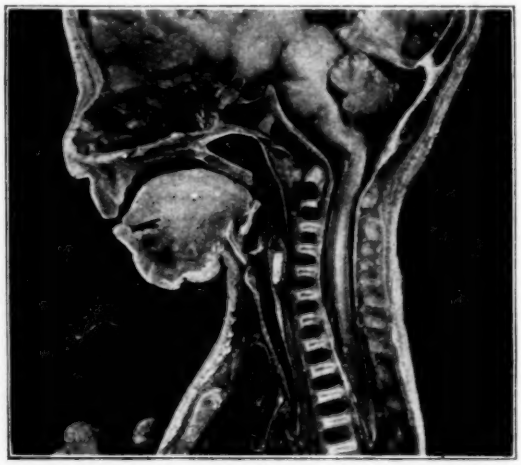
Modification of air tract for purposes of respiration. Head of an Indian Muntjac, or barking deer, in median sagittal section. (From a photograph by Henry George.)

and expiration are due, in part, to this primitive mechanism, and also to the fact that the larynx is only a specialised part of the tracheo-bronchial tree, and that the whole of the latter dilates at inspiration to such in fresh air, and contracts at expiration to expel used-up air. Furthermore, the amount of dead spare air is considerably diminished by these movements. Contraction and dilatation of the trachea are much greater in some fast-running animals than in slower man, and the amount of muscle tissue is proportionally increased.

EFFECTS ON CIRCULATION.

Sir Arthur Keith has brought to my notice, and impressed on me the importance of, the influence of movements at the glottis on circulation in the lungs; I have also derived much information on this subject from Prof. J. S. McDowall. The glottis in man is usually not quite fully dilated during inspiration, and because of this, and also owing to the narrowness of the aperture, slight obstruction is given to the inrushing air. Intra-thoracic pressure must therefore be less than atmospheric pressure for a short interval; blood is drawn into the right auricle because of the

FIG. IV.



Head of a seventh month fœtus in median sagittal section. (From a photograph by Henry George.)

diminished pressure on the pericardium, and the right ventricle obtains a larger supply. At the same time the lowered intra-alveolar air pressure causes the pulmonary capillaries to dilate, so that a more free and more rapid circulation of blood passes through them to the left side of the heart; the left ventricle pumps out more blood, and the aortic pressure rises. During expiration the slight obstruction offered by the narrow and partly closed glottis produces a considerably raised intra-thoracic pressure, so that the pulmonary capillaries are compressed and the pulmonary circulation is retarded; consequently the aortic blood pressure falls. There is, however, a certain amount of compensation, because of the fact that some blood is squeezed out of the lungs into the left side of the heart.

To help in maintaining an efficient pulmonary circulation, the movements of the glottis vary in accordance with the needs of the individual, and increase on exertion. The mechanism is not present in Fish, Amphibians, and some Reptiles, but is one found only in animals whose breathing depends in part on suction—that is to say, it is only present in those animals which suck air into the lungs by the movements of the ribs and diaphragm. In the lower Reptiles air is pumped into the lungs by various mechanisms, and it is therefore impossible for a condition of negative intra-pulmonary pressure to occur; the conditions are the same as in a Mammal on which artificial respiration is carried out by a pump. In fast-running animals the design of the glottis is such as to offer as little resistance as possible to the passage of air; it is probable, however, that in them such respiratory glottic movements as occur play a part just as in the case of man.

MODIFICATIONS FOR PURPOSES OF DEGLUTITION.

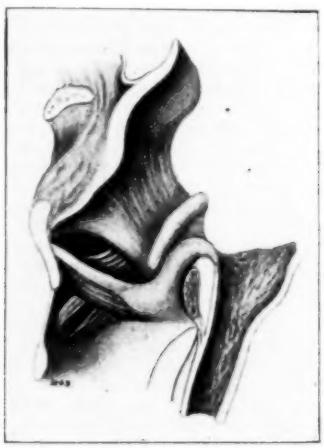
Protection of the Air Tract During Deglutition.—The pulmonary outgrowth springs from the middle line in the floor of the fore-gut, partly because that is a point of little resistance; the larynx has been shown to develop relations with the nose for various reasons, but it is to be emphasised that it is not guided in its earliest forms by considerations of future relation to

the nasal tube. Air enters in very low types by the mouth, and as the path of evolution is traced up there is to be found in all cases a continuation of this close relation of air tract and food passage. When nasal respiration is firmly established there is still a necessity for crossing of the two streams; if the lung bud had grown out of the dorsal wall of the fore-gut, as it does in fact, in some fishes, the trachea and nose might well have been brought into such close relation that no larynx would have been needed. As Mr. Alex. R. Tweedie has pointed out to me, there would have been a corresponding loss in powers of phonation.

Deglutition in Reptiles.—There are various mechanisms for preventing the entrance of food and water into the air passages. In Reptiles this takes the form of simple apposition of arytenoids and thyro-arytenoid folds, by means of the sphincteric muscle; there is no epiglottis, and there is no process of mastication.

Use of Epiglottis.—In mammals with a simple larynx, such as Marsupials and the Cat tribe, closure is of much the same type, except that during the swallowing of liquids help may be derived from the epiglottis, which has been evolved primarily for other purposes. The epiglottic cartilage has attached to it lateral folds, and these, in conjunction with the posterior palatine folds, cause the production of a lateral food channel, along which liquids may pass, probably without complete closure of the glottis or movement of the epiglottis away from the naso-pharynx. When a large bolus is swallowed, however, the epiglottis is drawn away from the raised soft palate up to the base of the tongue by means of the hyo-glosso-epiglottic muscle, and the glottis is closed by sphincteric muscular action.

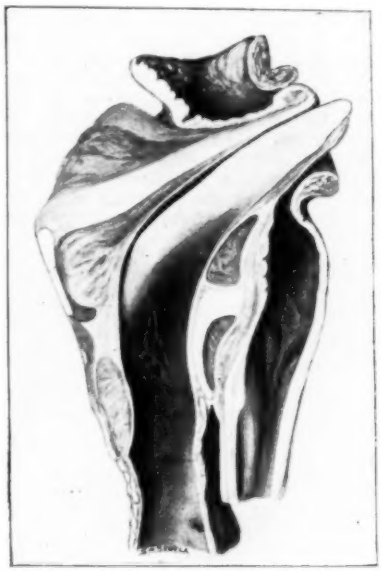
FIG. V.



Modification for purposes of deglutition. Median sagittal section of larynx of man of 50. (From a drawing by S. A. Sewell.)

Swallowing of Liquids in Man.—In chewing animals and in man the lateral food channel is made more efficient by means of aryteno-epiglottic folds, which protect the margins of the glottis from the entrance of food or water more efficiently than do lateral epiglottic folds. As the former take on this function, so the latter disappear, and in man they are absent. It is seen, then, that the epiglottis is called in to help during the swallowing of liquid; it is of little assistance when a solid bolus is passing (Fig. V.). When the ary-epiglottic folds are high and thin, as in man, there are developed in them supporting struts—namely, the cartilages of Wrisberg; their origin from the epiglottic cartilage has been dealt with fully by Goppert. They are almost always well developed in the human larynx, and by virtue of their presence the respiratory movements of the arytenoid cartilages are not interfered with; they reach their greatest development in whales and dolphins (Fig. VI.), if I am correct, and in conjunction with a complete arcus palato-pharyngeus enable simultaneous respiration and deglutition to occur. It is probable that they permit

FIG. VI.



Modification for purposes of deglutition. Median sagittal section of larynx of dolphin (*Delphinus delphis*). No. 1169E, Mus. Roy. Coll. Surg. (From a drawing by S. A. Sewell.)

a similar action to take place in the human infant, and also in those with the power of pouring pints of beer down their throats while breathing.

Swallowing of Solids in Man.—When solid masses or large quantities of liquid are passing into the œsophagus, the whole larynx with the epiglottis is pulled up to the base of the tongue. The epiglottis is not sufficiently large, nor does its position call for the presence of a hyo-epiglottic muscle; the latter is represented by a rudimentary hyo-epiglottic ligament.

Closure of the laryngeal aperture is brought about by the action of the various divisions of the sphincteric muscle—namely, thyro-arytenoid, thyro-epiglottic, ary-epiglottic, and inter-arytenoid. The arytenoid cartilages are approximated to each other and drawn towards the cushion of the epiglottis, and the cartilages of Wrisberg are similarly dealt with by fibres of the external thyro-arytenoid. The aperture of the larynx thereby closes in a T-shaped manner; the action is facilitated by the power of rotation of the cricoid on the thyroid, an action not possible in low forms.

The inter-arytenoid muscle runs underneath the hook-like processes of Santorini and tilts them forward as it contracts in this action; to provide an articulation for this purpose there is present in the muscle of many bolting animals, but not in man, a cartilage, probably a relic of the procricoid.

Functions of Cartilages of Santorini.—To the tips of the cartilages of Santorini are attached many fibres of the œsophageal aponeurosis, the suspension of the œsophagus, in fact, not being limited to attachment to the cricoid plate. When the cartilages are tilted forwards, the œsophagus is thus caused to open in a funnel-shaped manner, and so there occurs a beautiful mechanism by means of which the larynx is closed and the œsophagus is opened.

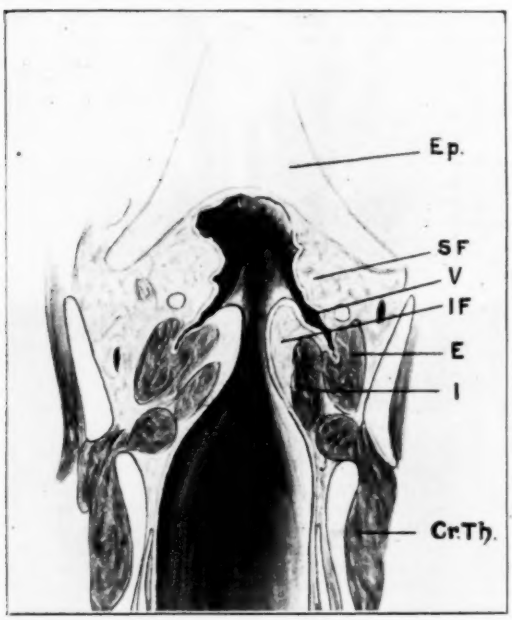
EXPULSION OF FOREIGN BODIES FROM AIR TRACT.

In coughing and sneezing a forced expiratory effort is made while the glottis is closed; when the air pressure has risen to a sufficient height the glottis opens, and the rush of air carries out mucus or other foreign bodies. In coughing the soft palate closes the naso-pharynx; in sneezing it leaves it partly open.

VOMITING AND AIR-SWALLOWING.

If an inspiratory effort be made with the vocal cords approximated to one another, and the crico-pharyngeal sphincter relaxed, air will enter the œsophagus; by closure of the crico-pharyngeus muscle and contraction of the œsophagus, the air can now be forced into the stomach. As a preliminary to vomiting, air-swallowing occurs; this is succeeded by violent emptying of the stomach. The glottis is closed and the thorax is compressed by muscular action until intra-thoracic pressure reaches a high level, when the laryngeal orifice suddenly blows open and allows an escaping blast of air to remove food débris from the upper air-passages.

FIG. VII.



Modification for fixation of thorax. Ventral half of larynx of Polar Bear (*Ursus maritimus*) in coronal section.
Ep. = epiglottis. S.F. and I.F. = superior and inferior thyro-arytenoid folds. V. = ventricle. E. and I. = external and internal divisions of thyro-arytenoid muscle. Cr.Th. = crico-thyroid muscle. (From a drawing by S. A. Sewell.)

MECHANISM FOR REGULATION OF INTRA-THORACIC PRESSURE.

In order to discover what is the function of those structures called vocal cords, and why they are so well developed in some animals not noted for their vocal powers, whilst in others with marked voice they are poorly formed, or not present at all, it is necessary to examine all the habits of animals, and not merely the habit of phonation; it is possible by this means to discover whether there is any factor which has an influence on the valvular arrangements of the thyro-arytenoid folds.

Independent Use of Fore-limbs.—In man there is one habit in particular which has helped him to advance rapidly along the path of evolution and to excel other species, and that is the superior power he possesses of using his fore-limbs for actions independent of progression. Having graduated as an arboreal creature, he has learnt to hold on to the branches of trees, and later to weapons and implements; he has developed a prehensile thumb, and the power of holding small objects in a stationary position at arm's length. He can suspend the weight of his body from his arms, but with less ability than can most monkeys; he can also adduct his arms with considerable power. He has, in fact, a great advantage over those animals which use the fore-limb mainly as a pivot on which the weight of the trunk is poised, while the hind-limb pushes the body forward in progression.

When a man adducts his arms against pressure he stops breathing; this may be done either because it is impossible for him to go on breathing, or because he gains some mechanical advantage by the action; the latter is the correct explanation. It is desirable that the thorax should be brought to rest, so as to give a fixed point of origin to the various muscles arising from it, and especially to those which move the arm at the shoulder-joint, the pectoralis major in particular. As the pectoralis major contracts, two things may happen: either the ribs are elevated and inspiration aided, or else the arms are pulled inwards and downwards while the ribs remain stationary. To make certain that the latter action shall take place, the abdominal muscles contract and hold down the lower ribs, but it is highly probable that in most instances the action is assisted by the imprisonment of air in the thorax.

Negative Intra-thoracic Pressure.—As the ribs tend to rise, so the capacity of the thorax would be increased, and air would normally rush in to fill the enlarged space. But if a laryngoscopic examination be made of a man who is adducting his arms against pressure, it will be seen that the vocal cords close with a snap at the beginning of the action. As no air can enter the lungs to fill the enlarged space that would be created if the ribs were elevated—provided that the diaphragm be in partial contraction—it is obvious that the thoracic walls will tend to come to rest before the intra-thoracic air pressure has fallen to a low level. Owing to the potential or actual diminution in pressure within the chest, there is brought in a new factor to assist the muscles which fix the thorax, in the form of atmospheric pressure. The result is that the ribs attain a stationary position with less expenditure of energy than would be required if no vocal cords existed, and a fixed point of attachment to the muscles in question is provided for.

To control the changes of pressure produced it is certain that sphincteric action at the larynx is insufficient by itself, wherefore valvular action has to be brought into play, in the same manner as occurs in the heart, veins, ileo-cæcal valve, and other regions; the mechanism is, in fact, a favourite one in the body. It is found that almost all animals possessed of the power of independent use of the fore-limbs have also an inlet valve mechanism at the glottis, formed by what are usually called the vocal cords; animals that spring by means of the fore-limbs from a crouching attitude are similarly provided. Those animals without these habits have no valvular folds. Thus it is found that the Hare has no valves, but the Squirrel has; Sheep, Oxen, and Deer have none, but Bears, Lemurs, Monkeys, and Men have (Fig. VIII.). The Chimpanzee is of more arboreal habits than the Gorilla and has better valves; he has not better voice, however.

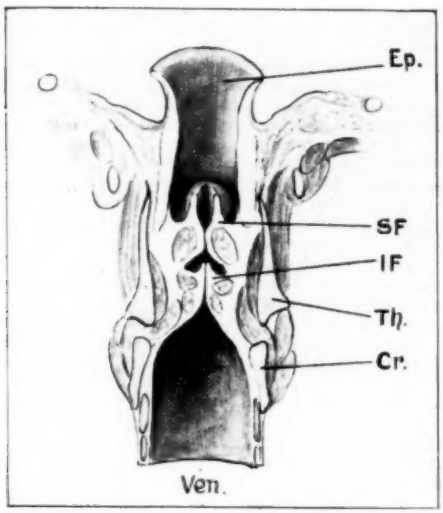
I have recently learnt from Prof. McDowall that temporarily diminished intrathoracic pressure does not necessarily cause stopping of the pulse, as Müller's experiment would lead us to believe; on the contrary, the aortic blood pressure is caused to rise, and the circulation is actually aided.

Positive Intrathoracic Pressure.—It is usually said that fixation of the thorax is attained by the taking of a deep inspiration and compression of the chest walls on this imprisoned air during closure of the glottis. Here, again, sphincteric action at the glottis is insufficient to withstand the high pressure produced, and valvular action again comes into play by means

of the ventricular bands. The action certainly occurs in man at times, but I do not believe it is by any means the usual method during forearm efforts.

The ventricular bands are the free and undercut lower margins of the ary-epiglottic folds, and in a form

FIG. VIII.



Modification for fixation of thorax. Coronal section of larynx of Yellow-Fronted Lemur (*Lemur flavifrons*). Vocal cords and ventricular bands both capable of acting as inlet valves: there is no valvular arrangement for preventing exit of air.
Ep. = epiglottis. S.F. and I.F. = superior and inferior thyro-arytenoid folds. Th. = thyroid cartilage. Cr. = cricoid cartilage. Ven. = ventral half of larynx. (From a drawing by S. A. Sewell.)

capable of functioning as a valve they are almost entirely limited to the Gibbons, Chimpanzee, Orang, Gorilla, and Man. In practically all other animals the only valve available is one capable of preventing entrance of air into the lungs, and in consequence the mechanism of thoracic fixation by raised pressure would be one practically peculiar to the five species mentioned. (Fig. VII.) It is nevertheless true that many animals, apart from these five, can fix the thorax, and it is therefore to be supposed that they do so by the method of diminished pressure. It is necessary to discover what is the reason for the special mechanism found in the higher apes and man.

Function of Ventricular Bands.—It is well known that in straining at stool the ventricular folds in man act as a valve, and that raised intrathoracic pressure is produced. It is possible that mobility of the upper ribs, present in Gibbons, the three other higher Apes, and man, gives a clue to the necessity for this special mechanism. Upper thoracic breathing has been described by Sir Arthur Keith as peculiar to the five species under discussion, and it is associated with mobility of the ribs. Contraction of the diaphragm in an effort to raise the intra-abdominal pressure tends to elevate the lower ribs. If the upper thorax is comparatively immobile, as it is in most animals, the lower ribs can be fixed and the diaphragm moves downwards and forwards as a piston; but if the upper thorax is freely mobile the ribs may move and the diaphragm remain stationary. Therefore, it seems probable that the ventricular bands are developed to act as a valve when it is desired to fill the thorax, and to retain the air under increased pressure. Thereby the ribs are spread, and the lower ribs are less likely to be elevated when the diaphragm contracts; consequently, the diaphragm has a more stationary attachment on which to exert its pull, and in its contraction will be able to raise intra-abdominal pressure with better results than would otherwise be obtained. Furthermore, when the thorax is full of air, its lower aperture has an increased diameter both transversely and antero-posteriorly, so that contraction of the diaphragm will take place at a mechanical advantage, and will cause a greater compression of the abdominal viscera if occurring while this position is maintained.

MODIFICATIONS FOR PHONATION.

I have attempted to explain that the larynx has taken up a certain position in order to subserve functions of olfaction and respiration, and that the peculiar situation it occupies in man can be understood if various structural characteristics of the human being are taken into account. I have endeavoured to show that the epiglottis was evolved for purposes of olfaction; the ary-epiglottic folds and cartilages of Wrisberg to provide a lateral food channel for the passage of liquids in animals which masticate their food; and the cartilage of Santorini as an important part of the mechanism by which the œsophagus is suspended and opened.

The arytenoid cartilages have been described as modified in length for respiratory reasons, and the muscles attached to them as concerned in the sphincteric closure of the larynx during deglutition, and in dilatation during respiration; the respiratory movements of the glottis were said to have a marked effect on the circulation of the blood. To those structures called vocal cords has been ascribed the function of preventing entry of air into the lungs for purposes of fixing the thorax, and the suggestion was made that valvular ventricular bands are concerned in the mechanism of raising intra-abdominal pressure in certain animals.

Because of these various observations, and because of a study of the vocal habits of animals in relation to the anatomical structure of the larynx in each species, the suggestion is reiterated that all mammals have an organ suitable for the production of sound, and that the extent of voice production depends in the main on the necessities and intelligence of the individual; some animals, however, and especially those of arboreal habits or arboreal ancestry, are better provided for than are others.

A discussion of the mechanism of phonation cannot be entered into here, but it will be sufficient to say that the evidence of comparative anatomy indicates, in my opinion, that variations in pitch of the voice are brought about by means of contraction and relaxation of the thyro-arytenoid muscles; and that raising of the pitch is due to increased contraction of these muscles, by virtue of which their elasticity is increased, while the rate at which they will recoil after being blown apart is accelerated.

This is a different view from that which ascribes to these muscles the function of relaxing the vocal cords, because in the former case the pitch would be raised by contraction of the muscles, while in the latter it would be lowered. I think that the attachment of the œsophagus to the cartilage of Santorini has an important function in the mechanism of phonation, but cannot elaborate the point in this paper; the evolution and mechanism of ary-vocalis muscle fibres must also be left out of account at present.

I would take this opportunity of recording my deep obligation for the privilege of permission to work in the laboratories of the Royal College of Surgeons of England, and also my sincere gratitude for the kindness extended to me by Sir Arthur Keith, who has given me invaluable advice and criticism in my work. I have also derived much information from Mr. Burne, and am very grateful to him. Acting on the advice of Sir St Clair Thomson, Prof. Frazer, and Mr. T. B. Layton, I have attempted to learn something of the mechanism of the human larynx by the aid of comparative anatomy and physiology. In the study of the larynx of animals with this object, I am deeply indebted to Dr. C. F. Sonntag for placing at my disposal a wealth of material, and the use of the laboratories of the Zoological Society of London.

An Address
ON THE
FUNCTION OF HÆMOGLOBIN IN THE BODY.

Delivered at St. Mary's Hospital on May 8th in the course of lectures on Pathological Research in its Relation to Medicine.

BY A. V. HILL, F.R.S.,
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HÆMOGLOBIN has two main functions in the body—the carriage of oxygen and the carriage of acids, including CO_2; the modes of carriage are different, but equally important. That of oxygen has long been known, and its characteristics have been the subject of many investigations; that of acids and CO_2, though often discussed and doubted, at last seems certain beyond dispute. A possible third function of hæmoglobin has recently appeared from the work of Miss Robinson in Hopkins's laboratory at Cambridge. She found that hæmoglobin and its derivatives, methæmoglobin and hæmin, are able to accelerate very considerably the oxidation of unsaturated fatty acids—e.g., of linseed oil. Its non-iron containing derivative, hæmochromogen, produces, however, no such acceleration. The importance of this observation lies in the fact that a certain amount of hæmoglobin certainly lies inside the tissues themselves; it does not occur merely in the blood. Possibly its function in the tissues is that of an oxidative catalyst. This property of hæmoglobin appears not to be a consequence of its easily reversible combination with oxygen: it occurs equally in hæmin and methæmoglobin, or in hæmoglobin fully saturated with carbon monoxide. The fact that the katalytic action does not occur with hæmochromogen suggests that the accelerating power of hæmoglobin lies in its content of iron. Iron, as O. Warburg has found, is an important agent in katalysing many oxidations analogous to those occurring in the body. The action of hæmoglobin on the oxidation of unsaturated fats appears to be even more effective than that of an amount of inorganic iron equal to that contained in the hæmoglobin. It would seem possible that the faulty iron metabolism occurring in such conditions as anæmia may result in slow or defective oxidation in the tissues. This might be one cause of the dyspnœa associated with those conditions. I have discussed this possible function of hæmoglobin first since little is known about it, and we may now turn to the other functions which are better understood.

REASONS FOR EXISTENCE OF HÆMOGLOBIN INSIDE CORPUSCLES.

In nearly all animals hæmoglobin exists inside formed corpuscles in the circulating fluid; it does not usually occur simply dissolved in the plasma. There has been much speculation as to the cause, or function, of the packing away of the hæmoglobin into these formed elements. It may be partly due to the necessity of retaining the hæmoglobin molecule, which is comparatively small, inside the blood-vessels; were it not inside the corpuscle, it might diffuse freely from the plasma into the lymph and from the lymph into the tissues, and so its usual respiratory function would be wasted. It may be to save it from excretion by the kidneys, though, indeed, this end might have been achieved by making the kidneys impermeable to hæmoglobin, as they are in animals in which that substance is free in the plasma. The most important reason, however, is probably to enable this sensitive respiratory substance to be subjected to one set of conditions, while the plasma—and the tissues which it bathes—are subjected to another and more appropriate set. The physico-chemical conditions obtaining in the plasma may be appreciably, possibly widely, different from those inside the red corpuscle. By such means the body is provided, so to speak, with another degree of freedom. It may be able, as an adjustment or an acclimatisation, to change the conditions affecting the hæmoglobin without altering those obtaining in the plasma and in the lymph throughout the body.

THE COMBINATIONS OF HÆMOGLOBIN.

The hæmoglobin molecule contains an atom of iron. In its combination with oxygen the maximum amount of that gas with which it can combine is the chemical equivalent of the iron in the molecule. The ultimate unit of hæmoglobin appears to have a molecular weight of about 16,700; it is comparatively small therefore, the colloid molecule sharing many of the properties of crystalloids, being capable of crystallisation and obeying the laws of chemical mass action. It may combine also with carbon monoxide, a matter of great practical importance, since nearly all the deaths which occur in coal-mining are due to poisoning caused by the high affinity of CO for hæmoglobin. The CO-combination appears to be exactly of the same nature as that of oxygen. Hæmoglobin combines also with nitric oxide (NO), but that reaction has been little investigated owing to technical difficulties. The combinations of oxygen and carbon monoxide with hæmoglobin are reversible ones. At a low pressure only a small amount is taken up, at very low pressures practically none, at higher pressures, however, the hæmoglobin becomes fully saturated with the gas. If the pressure be reduced the gas originally combined will be again released. The important characteristics of these combinations can be shown in a curve which is known as the "dissociation curve." The degree of saturation of hæmoglobin is plotted vertically against the pressure of the gas horizontally (Fig. 1). The idea is simple but the technique difficult; it requires experience before accuracy can be attained. It is necessary first to expose the solution of hæmoglobin in a so-called "tonometer" or "saturator" to any required pressure of the gas, which must be analysed afterwards to ensure that it is finally of the expected composition. It must be revolved for some time under defined conditions of temperature in order to allow it fully to attain an equilibrium. The solution containing the gas in combination must then be removed and placed in a blood-gas apparatus of the type designed by Barcroft, Haldane, or Van Slyke. In this way the degree of saturation, or rather the degree of unsaturation, of hæmoglobin may be measured. Allowance must then be made for the gas dissolved in physical solution. So investigated, a dilute solution of hæmoglobin, or a strong solution very carefully dialysed to free it from salts, and adjusted to the right hydrogen-ion concentration, gives a dissociation curve which appears to be a rectangular hyperbola governed by a simple chemical equation. The presence, however, of salts in a strong solution, such as occurs inside the red blood corpuscle, was shown by Barcroft and his colleagues in a series of very fundamental observations some 15 years ago, very considerably to affect the shape of the curve, turning it from the simple hyperbolic type to one possessing an S-shape. It is a very fortunate thing for the body that the actual dissociation curve of blood is of the latter form and not of the former. Respiration would have been difficult had the blood possessed the properties of a dialysed solution of hæmoglobin. Owing to the S-shape, it is possible for the blood to take in its oxygen and to be fully saturated at not too great a pressure, and yet to give it off again at a pressure not so much less. The supply of oxygen to the tissues, from the blood in the capillaries, depends upon diffusion and requires, therefore, a comparatively large pressure—i.e., a concentration of the gas in order to drive it along. If the gas could be released from the hæmoglobin only at a very low pressure, as is the case with dialysed hæmoglobin, the removal by the tissues of a large fraction of the oxygen contained in the blood would be difficult or impossible. As it is, a high degree of utilisation of the oxygen contained in blood is rendered possible by the shape of the curve.

MOLECULAR CONSTITUTION OF HÆMOGLOBIN.

From the physico-chemical standpoint the change in shape produced in a strong solution by the presence of salts appears to be due to an aggregation, or a polymerisation of the hæmoglobin molecule, or to some other cause reducing what may be called its thermodynamic "activity." In a concentrated dialysed solution, or, as Hartridge and Roughton have recently shown, in a dilute solution undialysed, the reaction appears to follow the chemical equation,

$$Hb + O_2 \rightleftharpoons HbO_2 \text{ (unaggregated molecules).}$$

In concentrated solution, however, in the presence of salts, the molecules appear to be aggregated, and the chemical equation to be,

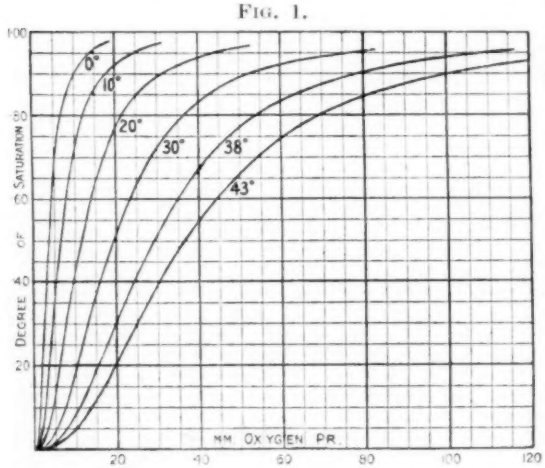
$$Hb_n + nO_2 \rightleftharpoons (HbO_2)_n \text{ (aggregated molecules).}$$

The fundamental unit, therefore, of hæmoglobin, as it exists inside a red blood corpuscle, seems to be Hb_n containing n atoms of iron and combining with n molecules of oxygen. The quantity n seems to be an average number representing the average degree of aggregation of the molecule. Most of the molecules are present as Hb_2, a minority as Hb_3.

FACTORS AFFECTING DISSOCIATION CURVE.

The dissociation curve is affected by various factors. A rise of temperature, both in the case of dialysed hæmoglobin and in that of whole blood, produces a large fall in the affinity of the pigment for the gas. This is a thermodynamic consequence of the fact that hæmoglobin combines with oxygen with an evolution of heat. It is of importance in the body, since the highest temperature of the blood occurs in the most active tissues which need the oxygen most, and the high temperature helps to drive the oxygen out. The dissociation curve is affected also by a change in the hydrogen-ion concentration, whether produced by the presence of CO_2 or by the addition of acid—e.g., of lactic acid from the muscles—to

FIG. 1.



Dissociation curves of human blood, at different temperatures, and exposed to a CO_2 concentration which would have given a pressure of 40 mm. at 38° C. Calculated for $n = 2{\cdot}2$, $K_{38} = 0{\cdot}00060$, $q = 19000$ cals. (Plotted in terms of oxygen pressures at the actual temperatures involved, instead of in concentrations of oxygen.)

the blood. The effect of CO_2 in diminishing the affinity of hæmoglobin is a large one and exactly similar to that produced by a rise of temperature: it is of importance both in the tissues and in the lungs, since the increased pressure of CO_2 in the capillaries of an active muscle helps to drive the oxygen out to the cells where it is wanted, whereas the diminished CO_2 in the lungs helps to allow oxygen to come in. The effect of fixed acid on the dissociation curve is important in connexion, both with asphyxia as was shown by Barcroft, and also with muscular exercise. The addition of 0·08 per cent. of lactic acid to blood, or even of 0·04 per cent., causes an extensive change in the form of the curve, a shift to the right (Fig. 1) similar to the shift produced by a rise of 5° C. Barcroft has shown that moderate exercise, such as walking up a mountain, may produce similar effects, which he attributed to the acid liberated by the muscles appearing in the blood. When it is remembered

FIG. 2.

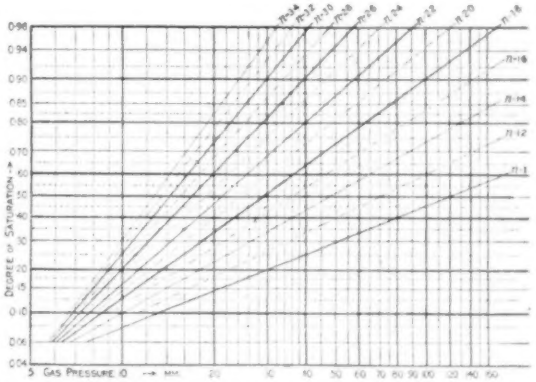


Diagram for plotting dissociation curves. Vertically $\log y/(1-y)$ horizontally $\log x$. If the observations obey the equation $y/(1-y) = Kx^n$, the points will lie on a straight line; the slope gives the value of n, which may be read directly on the diagram. A change in K only moves the line parallel to itself.

that severe muscular exercise may cause the appearance in the blood of as much as 170 mgm. of lactic acid in every 100 c.cm.—i.e., of 0·17 per cent.—it will be realised how extensive are the changes in the respiratory function of hæmoglobin which may be caused in this way. During severe muscular fatigue the blood, as a consequence of this effect of acid, may become more unsaturated as it passes through the capillaries, may have considerably more oxygen taken out of it at a given pressure than under normal circumstances—a fact for which the active muscles may well be grateful.

The equation of the dissociation curve, which may be deduced from the chemical formulæ given above, is $\frac{y}{1-y} = Kx^n$, with only two constants, K and n. Fortunately for the physico-chemical theory of the combination, the effect both of temperature and of a change in hydrogen-ion concentration appears to be directed at K only and not at n. K is largely diminished by a rise of temperature or of hydrogen-ion concentration, while n remains unaltered. This makes it possible to adopt a very simple form of dissociation curve, in which $\log \frac{y}{1-y}$ is plotted vertically, and $\log x$ horizontally. The resulting dissociation curve thus becomes a straight line, which may be drawn with a ruler if two points upon it be known (Fig. 2); a change of temperature, or of hydrogen-ion concentration, merely moves this line backwards or forwards, parallel to itself, without changing its slope. This method of plotting dissociation curves, though it tells us nothing physically about the nature of the reactions, is a great help in the rapid drawing and interpolation of dissociation curves, and in demonstrating the effects of the two chief factors which change them. From the slope of the line the value of n may be read off.

This effect of acid on the dissociation curve is not confined to the case of oxygen. As Haldane and his colleagues have shown, CO_2 has an exactly similar effect upon the dissociation curves for carbon monoxide; on the distribution curves, however, of hæmoglobin between CO and O_2, acids and CO_2 have no effect. This may seem at first sight paradoxical, but when we remember that acid has the same effect on the CO dissociation curve as it has on the O_2 dissociation

curve the result becomes obvious. There is no reason why it should work one way more than the other when both gases are present.

An explanation of why acid has this most important effect on the affinity of hæmoglobin for oxygen, or CO, has long been lacking. Recent work, however, has provided a tolerably certain one. Hæmoglobin, as it occurs in blood, is an electrolyte, a weak polyvalent acid. We may regard it therefore as dissociating according to the scheme:

$$H(Hb)_n \rightleftarrows H^{\cdot} + (Hb)'_n$$

in which the ion $(Hb)'_n$ has a very much greater affinity for the gas than has the molecule $H(Hb)_n$. Raising the hydrogen-ion concentration, therefore, tends, according to the laws of mass action, to depress the dissociation, to force the reaction to the left, to cause the formation of the undissociated molecule from the ions, and hence to produce a body having a smaller affinity for the gas. Raising the hydrogen-ion concentration, therefore, causes the hæmoglobin to give up its oxygen, raises the oxygen pressure. This process occurs in the capillaries; acid and CO_2 pass into the blood and help to drive the oxygen to the active cells which want it. Conversely, it is inevitable that raising the oxygen pressure should raise the hydrogen-ion concentration of blood. This effect has been shown directly by Parsons and more recently by Brown, indirectly—but equally certainly—by some observations of Haldane, of which I shall speak later.

METHOD OF CONVEYANCE OF ACID AND CO_2 BY BLOOD.

We will turn now to the question of how acid and CO_2 are carried by blood. It has long been disputed whether, on the one hand, CO_2 combines directly with hæmoglobin, either (1) as oxygen does, or (2) to form hæmoglobin carbonate or bicarbonate,

(1) $Hb + CO_2 \rightleftarrows HbCO_2$, or

(2) $HbOH + H_2CO_3 \rightleftarrows HbHCO_3 + H_2O$;

or whether, on the other hand, it is carried as bicarbonate by alkali released by the hæmoglobin or other weak acids in the blood,

$$NaHb + H_2CO_3 \longrightarrow NaHCO_3 + HHb.$$

It has been shown by Barcroft that the effect of CO_2 on the dissociation curve is precisely equal to that of the change in hydrogen-ion concentration which it produces. There is nothing left, therefore, for any specific effect: *CO_2 produces its change on the dissociation curve merely by its action as an acid* and in no other way. Conversely, therefore, hæmoglobin must deal with CO_2 as it would with an acid, not by any specific reaction such as that with oxygen and carbon monoxide. It is known, moreover, that in the ordinary range of CO_2 pressures there are no specific absorption bands corresponding to a direct compound of carbon dioxide and hæmoglobin. There would seem, therefore, to be only two possible ways in which the CO_2 could be dealt with: either the formation of sodium bicarbonate by means of sodium released by hæmoglobin, or the direct formation of hæmoglobin bicarbonate. The fact that CO_2 under all ordinary conditions is present simply as bicarbonate is shown, moreover, by the accuracy of the method of calculating the hydrogen-ion concentration by means of L. J. Henderson's equation,

$$cH = k.pCO_2/vCO_2.$$

If the term vCO_2 contained a large proportion present in some form other than bicarbonate, then the method would necessarily go astray; it is widely employed, however, and no serious discrepancies are found. Now an easy way of deciding whether the hæmoglobin combines with CO_2 directly, or liberates sodium to combine with it, is provided by the *determination of the sign of the electric charge on the hæmoglobin ion.* A recent, hitherto unpublished, research by H. Taylor has shown beyond question by electrometric methods that the hæmoglobin is there as an anion, carrying a total negative charge adequate to account for all the CO_2 which blood is capable of taking up. There is no doubt, therefore, that under ordinary circumstances hæmoglobin is present as the sodium or potassium salt of an acid—e.g., as Na_2Hb, an alkaline salt capable, like the salts of other weak acids, of acting as a "buffer," that is, of giving up its alkali to neutralise other and stronger acids. Such reactions as the following would occur:—

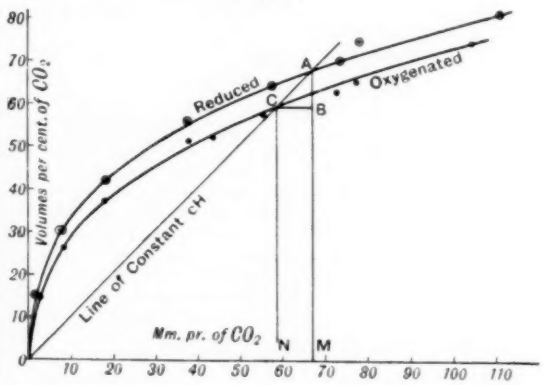
$$Na_2Hb + HX \longrightarrow Na_2HHb + NaX$$
$$Na_2HHb + HX \longrightarrow NaH_2Hb + NaX.$$

Had there been hæmoglobin bicarbonate present, then the hæmoglobin would necessarily have had a *positive* electric charge; this is quite definitely not the case. As the CO_2 pressure is increased, the total charge on the hæmoglobin diminishes—as it should if the latter be present as an anion—and indeed by adding acid may be made to disappear altogether and become positive, though small, on the opposite side of the iso-electric point. This point, however, occurs well outside the range possessing any practical physiological significance. Such considerations show that CO_2 not only *may* be carried but *must* be carried in the manner indicated. One could wish that the certainty of these facts would induce people, who still hold the contrary view, to spend their time in the discussion of something more profitable.

IMPORTANCE OF CO_2 DISSOCIATION CURVE.

The CO_2 dissociation curve is of considerable importance (Fig. 3). It differs from the oxygen dissociation curve; it has no S-shape at the beginning;

FIG. 3.



CO_2 dissociation curves of oxygenated and reduced human blood (J. S. H.). Christiansen, Douglas, and Haldane, 1914.

it does not approach a maximum, but continues to rise as the CO_2 pressure is increased. One of the most important—the most astonishing, the most intriguing—observations in connexion with the CO_2 dissociation curve was that made by Christiansen, Douglas, and Haldane on the effect of oxygen upon it. The combination of hæmoglobin with oxygen diminishes the amount of CO_2 with which the blood can combine! The explanation of this appears to be as follows. The hæmoglobin molecule is a very large one, with a number of groups on it capable of releasing a hydrogen ion and acting as an acid. At one particular group in the immediate neighbourhood of the iron atom very special conditions obtain, and when the iron combines with oxygen, as it probably does when that gas is taken up by hæmoglobin, the acid dissociation constant of the local hydrogen ion is very considerably increased. What was previously such a weak acid that it remained almost completely undissociated, has now become such a strong one that it becomes almost

completely dissociated and requires sodium to neutralise it. Consequently less sodium is available for the neutralisation of acids or CO_2, hence less CO_2 is capable of combining with the blood when oxygen has been taken up. This effect, which Haldane and his colleagues observed in 1914, is, as a matter of fact, a necessary consequence, from the physical standpoint, of the converse effect of CO_2 on the dissociation curves of blood. It is amusing to reflect that a phenomenon which could have been predicted from other well-known experimental facts had to wait for its discovery by actual experiment; it is strange how often one begins to predict only after the event! This effect of oxygen in changing the affinity of blood for CO_2 is of importance in the capillaries and lungs, in both of which it aids the transport of CO_2. It can scarcely be called an adaptation, for it deals with a definite inadaptable chemical property; it is a striking example, however, of the way in which the body is apt to find and utilise chemical reactions which seem so admirably to suit its purposes.

METHOD OF RETENTION OF HÆMOGLOBIN IN RED CELLS.

Hæmoglobin is retained inside the walls of the corpuscle by the presence of an impermeable membrane; so also are $Na^{\cdot}$, $K^{\cdot}$, and phosphate ions, but not $H^{\cdot}$ or Cl'. The wall of the corpuscle is very thin and elastic. Probably the total osmotic pressure inside it is equal to that outside. When the plasma has water or any chemical body added to it, the corpuscle swells or shrinks, so as to maintain an equality of osmotic pressure. The osmotic pressure of hæmoglobin is not inconsiderable and is probably balanced by the difference in the pressures of other indiffusible bodies, such as $Na^{\cdot}$, $K^{\cdot}$, and PO_4. By special methods it is possible to destroy the impermeability to $Na^{\cdot}$ and $K^{\cdot}$ while leaving that to Hb. If the boundary of the corpuscle be permeable to all salts, but not to hæmoglobin, the osmotic pressure of the latter necessarily causes the corpuscle to swell up. During the dialysis of blood corpuscles, without previous laking, this phenomenon was discovered by Barcroft, who found that the corpuscles swelled up into contact with one another, appearing to be a homogeneous solution, but becoming cloudy at once, as Brown showed later, by the addition of salts. The effect of adding salts is only temporary, and disappears as the salts distribute themselves evenly inside and outside the now permeable corpuscles; the latter then swell again under the osmotic pressure of the hæmoglobin inside. This experiment may be repeated again and again, the cloudiness appearing and then disappearing each time the salt is added. Another explanation of the phenomenon has been given by Brinkman, an explanation, however, requiring some credulity. It is supposed that the hæmoglobin in such cases is really outside in the solution, but that on the addition of salts it returns, by some process of adsorption or otherwise, to the inside of the corpuscle. A rough calculation, however, shows that if the hæmoglobin were distributed only on the surface of the corpuscle, it would form, not a monomolecular layer, but one about 100 molecules thick. It is difficult to see how it could hold on! Other explanations of the phenomenon than that advanced by Brinkman would seem more plausible.

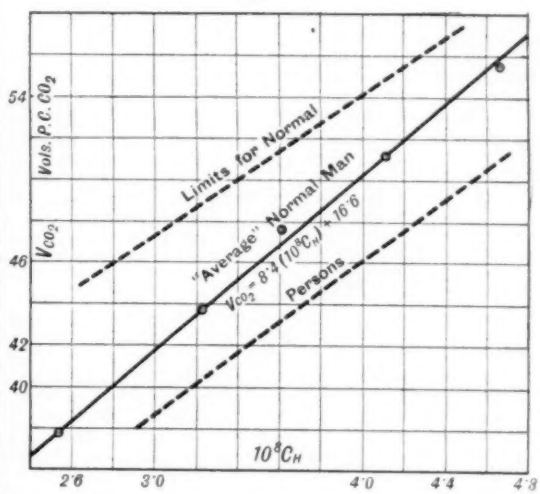
Bürker has described an interesting relation between the linear dimensions of a blood corpuscle and the amount of hæmoglobin which it contains. Over a wide range of animals the amount of hæmoglobin per corpuscle is apparently proportional to the surface of the latter. This also suggests, at first, that the hæmoglobin is connected with, or carried by, the surface of the cell. The amount, however, of hæmoglobin would seem to prohibit this explanation, since it is difficult to conceive adsorption, or any other physical process, to go on through a layer 100 molecules deep. It is far more likely, as L. E. Bayliss has suggested, that Bürker's relation depends upon the fact that the thickness of all the corpuscles is about the same, in which case their content of hæmoglobin would naturally be proportional to their area.

At the surface of the corpuscle there exists what is known as a Donnan membrane equilibrium. The presence in the corpuscle of charged ions, incapable of passing through its walls, produces a difference of electrical potential across its surface and a difference of concentration on its two sides of ions otherwise able freely to diffuse. This is not the occasion to discuss this membrane equilibrium, but it would seem certain that the differences which are known to exist, and the transformations which are known to occur, between the inside and the outside of the blood corpuscle, are due largely to the existence of this Donnan equilibrium.

"BUFFER" PROPERTY OF HÆMOGLOBIN.

The property possessed by hæmoglobin of acting as a weak acid which, in combination with alkali, is a very potent "buffer," explains the capacity of blood

FIG. 4.



Normal human blood cH varied by varying CO_2 pressure. Relation between rCO_2 and cH. The heavy line, which is exactly straight, denotes the relation for the "average" normal man, the broken lines enclose the relations for eight normal persons. The steepness of the straight line is a measure of the efficiency of "buffering," and is determined mainly by the amount of hæmoglobin in the blood. Barcroft, Bock, &c., 1922.

for holding—for neutralising—relatively large quantities of acid, without a serious rise of the hydrogen-ion concentration. Recent work by Barcroft and his colleagues has defined the relations which exist, in the blood of the average normal man, between the hydrogen-ion concentration and the CO_2 pressure on the one hand, and between the volume of CO_2 carried by the blood and the hydrogen-ion concentration on the other (Fig. 4). The steepness of the line, in the latter case, relating the volume of CO_2 carried in the blood to the hydrogen-ion concentration, is *a measure of the efficiency with which the blood is buffered;* the position of the line depends upon the amount of bicarbonate in the blood and may be altered by artificial means. Its slope, however, depends mainly upon the amount of hæmoglobin present in the blood; it will be less in the case of anæmic persons, more in that of persons acclimatised to high altitudes, with a high hæmoglobin content.

TYPES OF HÆMOGLOBIN.

It has long been discussed whether all types of hæmoglobin are the same, or whether different animals each possess their own characteristic pigment. It was

known, of course, that crystallographically the hæmoglobins of different animals were different: this, however, might be due merely to the specific globin portions of the molecules, and not be associated with any very striking physical or chemical differences. Recent work by Barcroft on the blood of a marine worm, *Arenicola*, has shown quite definitely that, both in its physical and its chemical properties, that animal, at any rate, possesses its own specific hæmoglobin. Barcroft's work was carried out with a wonderful little instrument, the Hartridge reversion spectroscope, which is becoming of more and more value in the study of the behaviour of hæmoglobin and blood. The principle of this instrument is not unlike that of the Barr and Stroud range-finder, in which two images are placed, one above the other, and a coincidence is obtained by the observer between corresponding lines or points. In the Hartridge instrument two spectra are placed, one above the other, one of them being reversed, and coincidence is obtained by placing two absorption bands in line. This method enables far greater accuracy to be attained than by the usual method, in the measurement of the wave-length of an absorption band, and has been adapted for determining the dissociation curves of dilute solutions of hæmoglobin, both with oxygen and CO. Employing Hartridge's instrument Barcroft found that the α-absorption-band of hæmoglobin from *Arenicola* is in quite a different place from that of human hæmoglobin, and—even more striking—that the distance between the CO α-band and the oxygen α-band is also very different. Correlated with these shifts in the α-band is a large change in affinity. The blood of *Arenicola* has an enormously greater affinity for oxygen, and a greater affinity for carbon monoxide, the latter, however, being increased nothing like so much as the former. Furthermore, Barcroft found that if we vary the animal, or the temperature, or the gas with which the hæmoglobin is combined, then under all conditions there is a linear relation between the affinity and the wave-length of the resulting α-band. Clearly there is something of a very fundamental physical character behind these observations. In any case, Barcroft has answered without question the long-debated problem of whether all types of hæmoglobin are the same, and has shown, moreover, the extraordinarily low pressures at which, in *Arenicola*, oxygen dissociation can take place. An animal which can utilise oxygen, which can reduce its hæmoglobin at these very low pressures, must have an amazingly effective oxidative mechanism.

EFFECT OF CO ON CAPACITY OF HÆMOGLOBIN FOR OXYGEN.

There is one curious and paradoxical observation, which is the last that I will discuss. If blood be brought in contact with a mixture of CO and O_2, and the pressure of the CO be varied from a finite value towards zero, then the degree of saturation of the hæmoglobin with oxygen will change; it will rise at first as the CO pressure is diminished, and will fall again as the CO pressure becomes very low and ultimately vanishes. It would have seemed at first sight almost inevitable that, as the CO pressure fell, the amount of oxygen taken up would rise continuously; CO turns out O_2, its removal should allow more O_2 to combine. There is a physico-chemical explanation of why the apparently common-sense view is wrong. We might—after the event—have predicted that the oxygen concentration would fall again. Douglas, Haldane, and Haldane, in any case, established the experimental fact, which explains an earlier observation by Haldane and Lorrain Smith—viz., that the condition of mice exposed to a very low pressure of oxygen did not deteriorate, but actually improved, on the admission of a small amount of carbon monoxide into the chamber in which they were! It would seem possible—though perhaps unlikely—that the breathing of a small amount of carbon monoxide might be of assistance in this way in aiding mountain-climbers suffering from oxygen-want at extreme heights.

DIRECTIONS OF FUTURE RESEARCH.

Hæmoglobin is one of the most interesting substances in the world. Many views are possible about it, and some of these views I have expressed here. Others you will find in books, particularly in Bayliss's "Principles of General Physiology." In 1919 Mr. Barcroft and I persuaded Sir William Bayliss to come to Cambridge to discuss with us, and with Dr. Hartridge, the problems of hæmoglobin. After our discussion I remember jestingly remarking that we ought to found a "Hæmoglobin Club"; Sir William Bayliss took the suggestion seriously, approached the Medical Research Council, and the "Hæmoglobin Committee" was formed. Much work has since been done; we have written, with great labour, and with many searchings of heart, a pamphlet on the reaction of the blood. Some of the most beautiful work of recent times, of a physico-chemical character, has been achieved by Hartridge and Roughton at Cambridge, on the chemical dynamics of hæmoglobin; my colleague Brown has established the validity of thermodynamic reasoning and chemical equations applied to the reactions of hæmoglobin. There is still, however, much to be done; one would like to know why the reaction between hæmoglobin, oxygen, and carbon monoxide is affected by light, the reason why the ion of hæmoglobin has so much greater an affinity for oxygen than has the molecule, the exact nature of the corpuscular envelope, and the origin of the equilibria which take place at its boundary. One would be glad to discover the chemical nature of hæmoglobin, and its manner of synthesis in the body. We know still very little, but we know enough to be quite sure that we are on the right lines in regarding the red blood corpuscle as a physico-chemical problem, and in investigating it by physico-chemical means.

THE POSOLOGY OF BEVERAGES

AS DETERMINED BY THE FRACTIONAL-DIURESIS TEST.

BY DR. P. L. VIOLLE,

CONSULTING PHYSICIAN AT VITTEL; DIRECTOR OF THE LABORATORY, INSTITUTE OF HYDROLOGY, PARIS.

IN certain patients it is necessary to know what becomes of liquids ingested by them and traversing a more or less abnormal organism. It is important to learn how the water intake is absorbed, diffused throughout the tissues and body-fluids, and, finally, how it is eliminated by the kidneys. Such knowledge of the course of water within the organism, especially important in cardiac, renal, and cardiorenal cases, is indispensable in view of the following objects: (1) exact regulation of the quantity of beverages employed; (2) logical distribution of their intake throughout the 24 hours; (3) indication of the conditions under which the absorption, diffusion, and elimination of water may be most perfect.

The term "beverages" should include all liquids received by the organism. In considering the total water intake, the water present in various foods must be included, since it constitutes an important part of the daily ration of water supplied to the organism. For present purposes, however, the following discussion refers to the water present in beverages.

Huchard and Fiessinger long ago pointed out the necessity for restricting beverages in asystolic patients. Widal has insisted that physicians should continually interest themselves in the quantity of liquids to be prescribed in cases of nephritis and in the regulation of food and drink according to given indications and particular cases. No method for such regulation has been hitherto available. In a case of Bright's disease, the permeability of the kidney must be known not only for urea and chlorides, but also for water. Whoever undertakes the management of Bright's disease must be familiar with these three factors. In ascertaining the general renal permeability it is a mistake to depend upon any single method,

such as the phenolsulphonephthalein test or the method of induced polyuria. The permeability for various substances must be determined, as Widal has clearly shown.

The fractional-diuresis test indicates the permeability for water. And, on account of the discrimination which it requires between renal and extra-renal factors, it supplies information concerning general disturbances in the water-content of the organism and permits recognition of causes and the regulation of beverages according to the pathogeny present. As with all tests based upon induced polyuria, the fractional-diuresis test includes a certain number of essentials. However, the latter have been reduced to the minimum compatible with the object in view. The test is essentially clinical and practical.

Description of Method.

The test must be made under four essential conditions: 1. With the stomach empty, because, after meals, the urinary elimination is normally retarded on account of portal hypertension accompanying digestion (this retardation constitutes true digestive opsiuria). 2. With the chlorides in equilibrium, since variations in the quantity of absorbed chlorides produce variations in the quantity of water eliminated. In practice, determination of chloride equilibrium is exceedingly simple, the only essential being to maintain a uniform chloride intake for at least two days (this necessity is simplified still further because cases dealt with are usually cardiac or renal, and ordinarily placed on a chloride-free regimen). 3. The test must be made twice, a one-day interval being preferably allowed. During the first test, the patient being erect, reclining during the second test. 4. The diurnal and nocturnal urine should be determined in certain cases, in which nycturia, continuing into the morning hours, may invalidate a test already begun, and the presence of nycturia is thus readily revealed.

Technique.

The bladder is first completely voided, the urine being rejected. With the patient erect or reclining, according to the order selected for the test, four portions of water, each of 200 g., are swallowed, at half-hour intervals. Following reception of the first portion, and until three half hours elapse after the last portion is swallowed, the patient urinates every half hour into a graduated receptacle, noting the quantity voided on each occasion. It is sometimes well to relieve the patient of responsibility by providing a series of six suitable graduates, into which the patient urinates successively, beginning at the left. The urinary elimination curve, showing the appearance, degree, retardation, and cessation of polyuria, may thus be noted at a glance. It is best always to note precisely the several quantities of urine collected.

Results Obtained.

Following the intake of 800 g. water, as described, induced polyuria normally occupies a period of six half hours. The first and sixth fractions of urine are about 35 c.cm. each, return to this quantity showing termination of the test. The normal sequence is shown as follows:—

Time (A.M.)	Grammes water taken.	Grammes urine collected.
7.0	200	—
7.30	200	35
8.0	200	60
8.30	200	180
9.0	—	300
9.30	—	220
10.0	—	35
	800	830

The quantity thus collected first should be about 35 or 45 c.cm. A larger quantity suggests nycturia, prolonged into the morning. If nycturia seem present the total 24-hour excretion should be collected in two periods on the following day. The diurnal urine is collected from 9 A.M. to 9 P.M., the patient remaining erect, either sitting or standing. The nocturnal urine is voided from 9 P.M. to 9 A.M., the patient reclining. Inversion of the normal quantity of urine voided diurnally and nocturnally shows the presence of nycturia. Normally, the diurnal urine constitutes about two-thirds the total 24-hour quantity.

The last quantity collected may be larger than the first. If it be about 60 to 70 c.cm. the test is incomplete and should be continued for another half hour. Such prolongation only shows still more clearly a delay in elimination already indicated by the quantities of urine previously collected. The clinostatic results should be compared with the orthostatic results, since such comparison permits diagnosis of atypical elimination and indicates the intake of liquid which may be desirable for each particular case, whose needs are shown by the test.

The test indicates three main groups of conditions, more or less closely approximated in various cases. The table indicates the three possibilities. It is well to emphasise again, at this point, the great importance of distinguishing nycturia and its effects on the test from induced polyuria of high degree. Error of this kind seriously affects the results.

Group.	Position.	Urine passed.	Interpretation.
1	O } C }	Equal and normal.	No disturbance, renal or extra-renal.
2	O C	Diminished Increased.	Cardio-vascular affections.
3	O } C }	Equal and abnormal.	Disturbed water absorption { Stomach. Intestine. Liver.
			Disturbed water diffusion { Membrane permeability altered. Humoral disturbance, especially chloride-retention.
			Renal disturbance.

O = orthostatic. C = clinostatic tests.
The term "equal" means approximately equal only.

In group 3 the test does not indicate the nature of the lesion producing defective elimination of water by the kidney, but shows that a lesion requiring diagnosis by the usual methods is present. Let us examine each of the three groups in detail.

Group 1.—Elimination is identical and normal, orthostatically or clinostatically. The absorption, diffusion, and elimination of water may therefore be considered unaffected, and renal and extra-renal conditions may be regarded as normal.

Group 2.—Clinostatic is better than orthostatic elimination. Cardiovascular disturbances, impeding the circulation of water within the organism, may be assumed to be present. Linossier and Lemoine have shown that orthostatic oliguria is caused by circulatory disturbances, the cardiovascular apparatus being defective while the secretory capacity of the kidney may be normal. Conditions in Group 2 must be closely scrutinised. If the orthostatic is less than the clinostatic elimination, the latter being normal, the cardiovascular affection present is of simple nature. For example, take the following elimination scheme:—

O .. .. 35 .. 55 .. 90 .. 200 .. 175 .. 85
C .. .. 35 .. 60 .. 180 .. 300 .. 220 .. 35

In this case estimation may be made by subtraction, the influence of cardiovascular factors in the urinary-water anomalies may be noted, functional cardio-vascular disorder may be assumed, and cardiac insufficiency may be suggested, as Merklen has remarked.

If clinostatic elimination is abnormal, affections besides the cardiovascular disturbances exist. The combination is indicated as follows:—

O .. .. 35 .. 55 .. 90 .. 200 .. 175 .. 85
C .. .. 35 .. 55 .. 120 .. 230 .. 180 .. 70

Here the exact influence of the cardiovascular factors present cannot be determined by the scheme, because aggravating factors are superadded. We may now consider Group 3.

Group 3.—Orthostatic and clinostatic elimination are practically equal, and cardiovascular affections may be excluded. However, the elimination is abnormal in both positions. The abnormality may be due to failure of the water to reach the kidneys normally, or to defective renal secretion, renal impermeability to water permitting the latter to reach the kidneys normally without being fully eliminated.

These different factors may be duly distinguished by systematic clinical examination. It should first be determined whether water reaches the kidneys normally.

(*a*) Gastric evacuation may be delayed. Normally, 200 g. water, received by the empty stomach, remain there for five to six minutes. Longer delay is due to retarded evacuation, most commonly on account of gastric dilatation. Here water may remain in the stomach for five or six hours after ingestion, the fractional-diuresis test naturally showing considerable delay in diuresis. The kidneys behave as if no water had been swallowed. In certain cases, as shown by Surmont and Tiprez, the diuresis test may permit diagnosis of pyloric stenosis.

(*b*) Gastric evacuation being normal, intestinal absorption may be retarded. Intestinal absorption is especially governed by the portal tension. Increased portal tension delays absorption. Gilbert, Lereboullet, and Villaret have shown that hepatic affections rapidly produce portal hypertension through intra-hepatic circulatory obstruction. Opsiuria occurring in such cases constitutes an early sign of hepatic alteration.

In intestinal affections, and especially diarrhœa, water is evacuated with the stools. In retarded elimination due to intestinal conditions, the kidneys are not affected. If anomalies in diuresis are not explained by supplementary renal examinations referring to albuminuria, azotemia, and the blood chlorides, clinical examination of the stomach, intestine, and liver is indicated.

(*c*) In the presence of a normal digestive tract, diffusion of water within the organism may be altered. After normal absorption by the digestive tract, water may not normally circulate within the organism if affected by the following factors: (1) alterations of the tissues rendering them more or less impermeable and resulting in obstruction, in various membranes, to the free passage of water; (2) humoral disturbances. The movements of water within the organism are determined by normal or pathological variations in humoral equilibrium. Working with Labbé, and basing our conclusions upon the numerous modern studies on colloids, lipoids, mineral substances, and hydrogen-ion concentration, we have believed it possible to indicate four equilibria of especial importance in the hydric exchanges. These four equilibria are osmotic, acido-basic, lipocytic, and mineral.

Retention or displacement of the circulating water may follow disturbance of one or more of these equilibric factors. Sodium chloride being the agent which practically predominates in hydric regulation, affections of the latter are reducible, in the last analysis, to retention of water produced through chlorides. Diuresis is therefore affected in such states. Altered diuresis, however, is not a guide to renal impermeability for water, which may be retained solely through the action of chlorides. Before œdema becomes apparent and clinically evident by pitting on pressure, as much as 5 to 6 litres of water may be retained within the tissues. If chloride retention of water be suspected, the serial test devised by Pasteur Vallery-Radot, and consisting in the ingestion of quantities of salt with successive weighing of the patient, should be utilised.

Functional Elasticity and Functional Capacity.

If complete clinical examination fully eliminates all but renal factors in the altered diuresis observed, the latter may be considered due to renal impermeability for water. In such cases, and from the viewpoint of aqueous diuresis, two conditions may be considered which I will term, respectively, functional elasticity and functional capacity of the kidney. Functional elasticity is the ability of the kidney to respond to the excretory requirements of the organism. Functional capacity corresponds to the maximal excretory ability of the kidney.

A normal kidney has great functional elasticity, responding readily to the excretory variations physiologically required of it. A diseased kidney, on the other hand, as Albarran has shown, tends to excrete a uniform quantity regardless of conditions present. The importance of knowing whether functional elasticity of the kidney really exists, and of exactly determining its degree and power of accommodation, may be readily understood. The fractional-diuresis test supplies information on this essential point, upon which depend the indications for restricting beverages in Bright's disease (without œdema).

In order to illuminate the discussion, we offer three analytical statements, obtained clinostatically, and showing retarded elimination assigned to the kidneys only, making the critical examination described above. The three outlines show progressively diminishing functional elasticity and eliminative retardation which is rendered still greater by diminution in functional capacity.

(*a*) C.cm. urine collected: 25, 30, 45, 120, 160, 70. The urine contains pus, blood, and traces of albumin. Blood pressure, systolic 17, diastolic 10.

(*b*) C.cm. urine: 15, 18, 65, 125, 80, 25. The urine contains a small quantity (0·16 g.) albumin. Blood-urea, 0·50. Blood pressure, systolic 22, diastolic 15.

(*c*) C.cm. urine: 40, 35, 35, 33, 35, 35. Albumin, 2 g. Blood-urea, 1·5 g. Blood pressure, systolic 28, diastolic 15.

In case (*a*), of 800 c.cm. water ingested, but 450 c.cm. are eliminated within the period fixed for the test. In (*b*) and (*c*) the respective elimination is of 325 and 213 c.cm. But much more important than the total elimination is the diminution in functional elasticity. In case (*a*) the kidneys give no material response before the fourth half hour. Then, under the first maximal influence following ingestion of the total of 800 c.cm. water, they excrete the maximal quantity permitted by their functional capacity, or 160 c.cm. only at the fifth half hour, the usual elimination being almost immediately resumed. The reduction in functional elasticity is clearly evident. The elasticity is not wholly abolished, however, and must be taken into account in arranging the water ration. The latter must not be so rigidly restricted for mere diminution, as it will be for entire loss, of the functional elasticity of the kidney. In case (*b*) the elasticity is still less, a feeble eliminative effort, which is immediately arrested, appearing not earlier than the fourth half hour. In case (*c*) functional elasticity is lost and the kidneys are absolutely incapable of reacting.

Tests should be repeated in order to show the state of the kidneys from time to time. Moreover, exact information as to the renal condition is obtainable only by repeating the tests. The importance of regulating the liquid intake is readily understood. For example, in case (*c*) but 213 of the 800 c.cm. water ingested are excreted in six half hours. The total blood mass is appreciably increased; the blood pressure, already high, is raised still further; headache, due both to urea retention and to high blood pressure, is aggravated, and vertigo occurs frequently. The test shows us that the patient, for the moment, is incapable of eliminating more than an average of 35 c.cm. urine per half hour. The liquid intake, including milk, must be rigidly limited to 35 c.cm. per half hour, whether referring to meals or to other periods, and must include water present in soups and, as far as estimation is possible, in all other foods as well. For a few foods the water content is as follows: Cereals and legumens 10 per cent. to 14 per cent., roots and tubers 75 per cent. to 90 per cent., fruits 85 per cent., bread 30 per cent to 40 per cent., meats 55 per cent. to 75 per cent., milk 75 per cent. to

90 per cent., cheese 35 per cent. to 45 per cent. In the case considered, the total 24-hour urinary elimination and the urinations are much diminished. With such diminution of functional capacity and elasticity urinary excretion cannot be increased, and the case is grave.

In some cases the functional capacity may be high enough to permit excretion of 55 to 80 c.cm. in the absence of functional elasticity. Under such conditions from 70 to 80 c.cm. liquid may be allowed per half hour, and the total 24-hour excretion of urine is readily rendered normal. In most cases functional elasticity exists in some degree, and the most favourable quantity of water allowed must be determined by varying the quantities used in the tests. The most favourable quantity permissible corresponds to the minimum which is followed by maximal elimination. In a word, the dosage of beverages for each particular case may be regulated by an exact knowledge of the factors affecting the elimination of water, and by evaluating the effects assignable to each factor.

Conclusions.

1. In cardiovascular affections beverages should be taken with the patient reclining, and preferably on awaking in the morning and on retiring for the night. As far as possible drinks should be taken in small quantities at a time and not during meals. In a general way beverages should be reduced in proportion to the degree of cardiac insufficiency present, or, in other words, in proportion to the difference between orthostatic and clinostatic elimination.

2. In delayed absorption from the digestive tract, (*a*) gastric dilatation may exist. In this case beverages should be taken only a long time after meals, and in small, divided doses, the patient lying recumbent. If (*b*) intestinal affections, such as profuse diarrhœa, be present, beverages need not be reduced, but should be so prescribed as to bring the total 24-hour quantity of urine as nearly normal as possible. If (*c*) pathological, and especially hepatic, portal hypertension exist, the quantity of liquids which produce most abundant elimination of urine should be determined by making a number of trials. Preferably beverages should not be taken with meals in order not to add physiological hypertension to the portal hypertension already present. Physiological opsiuria may thus be avoided.

3. In humoral disturbances, and especially in retention due to chlorides, the patient should not receive chlorides with the food, and the beverages should be nicely adjusted to the reduced but remarkably uniform elimination commonly present in cases of this kind, at least in fully developed dropsy accompanying nephritis.

4. In purely renal affections the suggestions already given should be followed, especially with reference to functional elasticity and capacity of the kidney.

5. In exceptional and atypical cases, which occur frequently, consideration of the many factors which may be present, with estimation of the importance of each one, should permit suitable regulation of the beverages to meet the needs of the case in hand.

Clinical and Laboratory Notes.

A CASE OF CONGENITAL CARDIAC MALFORMATION WITH PULMONARY TUBERCULOSIS.

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AND
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THE prolongation of life for 28 years in the case of a patient suffering from grave congenital cardiac defects and the terminal association of this condition with pulmonary tuberculosis would appear to be sufficiently rare to merit record. It is also remarkable that an individual with such cardiac conditions was able to attempt to work—first as a pit-pony lad and later to engage in light labour in a ganister work.

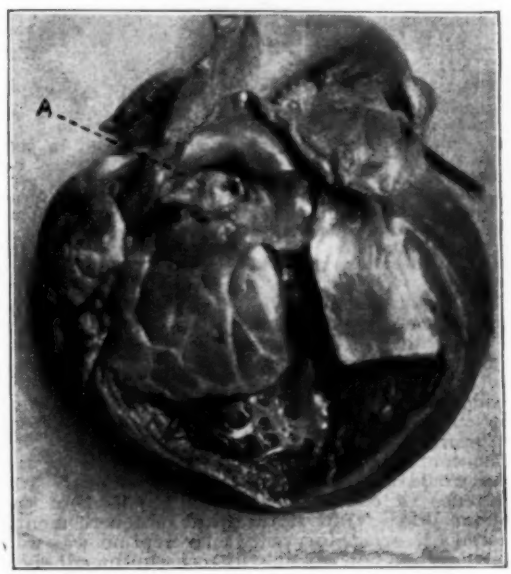
The patient, a male aged 28 years, was admitted to Middleton Sanatorium on Jan. 25th, 1923, on the recommendation of Dr. Samuel Bryson, district tuberculosis officer. The chief symptoms were cough, pain in the chest, dyspnœa, and cyanosis, the evidences of cardiac disease dating from birth and those of pulmonary tuberculosis from June, 1922. Slight hæmoptysis was reported six months before admission, and occasional recurrences. Clubbing of the fingers was present. The face, lips, ears, and fingers displayed the characteristic lividity. There was no marked dyspnœa at rest. On physical examination dullness was found over both lungs with feeble breath sounds and few râles; on each side of the sternum a bulging was evident between the levels of the third and sixth ribs. The area of præcordial dullness showed no extension to the left and there was no thrill. A prolonged blowing systolic murmur was audible, and the second pulmonic sound was noticeably weak. T.B. were present in the sputum, and an examination of the blood showed red cells to be 5,900,000 per c.mm. and white 6250 per c.mm.

Progress of Case.—The patient was confined to bed, and appeared to be fairly comfortable until 7 A.M. on Feb. 7th, when he was found in a state of grave syncope, having risen from bed in spite of prohibition to go to the lavatory, and five hours later a fatal result ensued.

Post-mortem examination revealed the following conditions.

Right lung: Apical adhesions. Marked venous congestion. Cavity of the size of a walnut filled with caseous debris at apex. Scattered tubercles throughout upper lobe and the upper third of lower lobe, the middle lobe being less affected.

FIG. 1.



Showing pulmonary artery laid open, giving distal view of diaphragm formed by coalescence of semilunar valves (A), with small calibre opening.

Left lung: Apical adhesions. Marked venous congestion. Cavity at apex similar to that in right lung. Scattered tubercles throughout upper lobe and upper half of lower lobe. Base healthy.

Heart: Right auricle shows a wide patency of the foramen ovale, admitting the index finger with ease, also well-developed Eustachian valve, which is continuous with the valve of Thebesius. The opening of the tricuspid orifice is smaller than usual. Right ventricle shows considerable

thickening of its right lateral and posterior wall, which is almost as thick as that of the left ventricle; anteriorly the wall becomes very thin in the region of the conus arteriosus. The pulmonary valve presents adherent cusps with a central patency which admits only of the passage of a goose-quill, the surface being almost cartilaginous to the touch, and having an eroded appearance in the centre owing to the presence of hard vegetations. Similar calcareous excrescences are present on the ventricular surface of the cusps. The conus arteriosus shows a remarkable elongation and is dilated in the neighbourhood of the pulmonic cusps. The right papillary muscle is large, and projects chordæ tendineæ to the three cusps: the left papillary muscle is represented by a single chordæ tendinea. Posterior to the pedicle of the

FIG. 2.

Showing aperture (A) in ventricular septum viewed through left ventricle.

anterior papillary muscle is an oval opening through the fleshy inter-ventricular septum 3 cm. by 2 cm. in size, situated in its lower third. This channel between the ventricles is sacculated below by the interposition of a fine fibrous curtain coated with endothelium, which forms the lower border of the opening into the left ventricle and limits its extent. The mitral opening is larger than normal. There is a dilatation of the pulmonary artery distal to the adherent pulmonary valves. The ductus arteriosus is not persistent.

The striking features of this case are: (1) The marked stenosis of the pulmonary artery through the close adhesion of the semilunar valves; (2) the occurrence of the rarer warty form of endocarditis affecting the adherent pulmonic valves; (3) the considerable size of the aperture in the inter-ventricular septum; and (4) the marked patency of the foramen ovale.

The course of events in the early history of the organ would appear to have been as follows: The occurrence of endocarditis affecting valves of the pulmonary artery about the third or fourth month of fœtal life, when the ventricular septum was well developed but not closed, with consequent adhesion of the valves and obstruction to the blood flow. The over-charged right ventricle would then discharge part of its contents through the patent ventricular partition, and this considerable volume of blood would obviously prevent the normal closure of the septum. Similarly in the case of the inter-auricular septum, whereas at birth the augmented return flow of blood from the lungs normally tends to close the valve-like fold which forms during the fourth month of fœtal life,[1] this counter-pressure would be wanting owing to pulmonary artery obstruction, with the result that the foramen ovale would continue patent. This view is contrary to that expressed in the reference below,[2] but the fact that no developmental errors were found in other parts of the body in the present case lends support to the opinion that the original defect was due to endocarditis.

[1] Allbutt's System of Medicine, v., 715.

A CASE OF STRANGULATION OF THE ILEUM BY AN INFLAMED APPENDIX.

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THIS case is recorded as an example of a rather unusual cause of strangulation of the bowel.

A negro, aged 15, was admitted to Barbados General Hospital under Dr. Gerald Manning on Feb. 21st, 1924, with a history of two days' abdominal pain, chiefly around the umbilicus, and no vomiting. In July, 1923, he had a somewhat similar attack overcome by high enemata, which had no effect this time.

Condition on Admission.—Temp. 98° F., pulse 40, later 60; abdominal facies, colicky attacks of pain referred to the umbilicus but no visible peristalsis, and an intensely tender painful tumour on right side, the largest part level with the umbilicus, and moderate abdominal distension. A high enema brought back a coloured result only, and the patient vomited bile four times.

Immediate operation showed that a large loop of greatly distended ileum, two feet long, was strangulated by the appendix looped around it in a tight ring, with the bulbous, swollen, and almost gangrenous tip adherent to its base at the cæcum and containing a fæcal concretion. The apex was freed, appendicectomy performed, the raw surface on the bowel sutured, and the whole returned to the abdomen. Wound healed by first intention.

Probably what occurred was that the long appendix kinked back on itself forming a loop; the apex became blocked and finally inflamed and then adherent to the base in consequence; a loop of ileum slipped through the ring so formed and became strangulated.

I am indebted to Dr. Gerald Manning for permission to publish this case.

CONGENITAL BONY OCCLUSION OF THE CHOANÆ.

BY ALBAN EVANS, M.R.C.S. ENG.,
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THE rarity of the condition should make the following case worthy of record.

D. W., male, aged 3 weeks, was brought to the out-patient department with a history of difficulty in breathing. Cyanosis and snuffling noticed soon after birth. Both sides of the nose were full of gelatinous mucus, and on probing a bony diaphragm was found completely blocking the choanæ.

The family history was interesting. Six years previously a baby had been born which survived 15 minutes. A year later came a second, which lived 24 hours. A third arrived the following year which lived for about 36 hours, and which had something wrong with the nose and throat. Two years later came a fourth baby which survived four and a half months, although blue all the time, which was attributed to heart disease.

The bony partition was thoroughly broken down. The baby had to be kept in hospital a month on account of digestive trouble, and when he left he appeared quite well.

[2] Ibid., v., 714.

LEWES VICTORIA HOSPITAL.—The accounts presented at the annual meeting of the governors of the hospital on May 6th showed a balance overdrawn on Dec. 31st of £169, as against £215 on Dec. 31st, 1922. The report stated that a new and up-to-date X ray apparatus had been installed at a cost of £399, and it was hoped the cost would be met without having to draw upon the invested funds. In 1914, when the system of private in-patients was started, the receipts were £61; in 1923 they totalled £275.

Medical Societies.

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY.

A MEETING of this Society was held at Leeds on April 11th, Prof. E. O. CROFT being in the chair.

Blood Transfusion for Post-partum Hæmorrhage.

Dr. MCGREGOR YOUNG gave a report on blood transfusion for post-partum hæmorrhage at the Leeds Maternity Hospital, in cases where the patients presented all the signs and symptoms of impending death. Intravenous saline and gum solution had been tried without improvement or with relapse; four cases were placenta prævia, one accidental ante-partum, one hydatid mole, one abortion. All recovered; in three cases the improvement was immediate—in four cases after two hours. All were correctly grouped, except in one case on account of extreme urgency, but which did well. All the cases complained during transfusion of præcordial oppression and of fullness in head and neck. There was laboured breathing and cyanosis. On the other hand, no excruciating lumbar pains, no abnormal dropping of the pulse-rate, no high fever, and no hæmaturia followed, these latter being the signs of agglutination and hæmolysis from incorrect grouping. The probability is that the rate of transfusion was too rapid for unfilled veins and the empty right side of the heart, although usually 25 minutes were taken to transfuse a pint. Citrate of soda was used, about 4 ounces of 2 per cent. solution to the pint. A much prompter resort to blood transfusion was advocated where a donor could be found. Most of the disasters were due to delay.

Malposition of the Uterus after Delivery.

Dr. YOUNG also gave a report on 1000 consecutive deliveries examined on the twelfth day after labour at the Leeds Maternity Hospital with a view to malposition of the uterus. Retroversion was found in 50 cases—that is, 5 per cent. No pessary was inserted, nothing was done, and the patients were discharged without remarks. Most of these attended at intervals later. At the end of six months these 50 cases were asked to attend, and 32 came for re-examination. Of these 32 retroversions 30 were found normal and anteverted—that is, 93·7 per cent. —2 only remained retroverted, one from cause not apparent, the other from several fibroids in the posterior wall of the uterus. Cause for the puerperal retroversions was sought, but in 21 cases nothing apparent was found, the puerperium having been perfectly normal. In 6 cases there had been sapræmia of mild type, in 3 cases placenta prævia, and in 2 cases severe post-partum hæmorrhage. This report was thought to be of interest in view of (1) that it is a common routine to insert pessaries for puerperal retroversion in most maternity hospitals; (2) that it is the common teaching in most text-books that such treatment is the correct procedure.

Exhibition of Specimens: Chorion-Epithelioma of the Ovary.

Dr. D. DOUGAL (Manchester) showed a specimen of chorion-epithelioma of the ovary from a patient aged 29. Her first pregnancy terminated at seven months, two and a half years ago, the second at four months in March, 1922. Until Christmas, 1922, she menstruated every 5-6 weeks. A fall, with mild head injury, at Christmas was followed by vaginal bleeding which continued till September, 1923, when abdominal enlargement was first noticed. Amenorrhœa from September, 1923, till her admission to hospital five and a half months later. Pain in the left lower abdomen for several years, became worse with the onset of bleeding. During the present year there had been intermittent vomiting and the abdominal pain had increased in severity, being particularly acute on Feb. 6th and 13th. On admission she was thin and emaciated, her skin had a yellowish tinge; temperature normal; pulse 100; soreness in left lower abdomen. There was a tense, very tender tumour between the pubes and the umbilicus with its centre to the left of the middle line, suggesting a pregnant uterus with concealed hæmorrhage; the cervix was drawn up and pushed forward by an elastic swelling filling the pelvis and continuous with the abdominal swelling; the uterus appeared to be in front and to the right. Total hysterectomy with removal of both appendages was performed on March 1st, 1924. Straightforward convalescence and discharge from hospital four weeks later. The pelvis appeared to be quite clear. She reported at the out-patient department one week after discharge and a small swelling, the size of a tangerine, was felt high up on the left side close to the rectum. The specimen comprised (*a*) the uterus, soft and enlarged, endometrium 1 cm. thick, no visible growth in the uterus; histologically the endometrium had been transformed into decidua; (*b*) the right ovary, enlarged about four times, contained a number of small lutein cysts and some scattered lutein tissue; (*c*) on the left, the tumour, $6 \times 5\frac{1}{2} \times 4$ in., bright red in colour, surface nodular, partly covered above and in front by the broad ligament; the Fallopian tube ran around the upper anterior portion of the mass, the left ovary was merged in the tumour. Histological examination showed the tumour to be a chorion-epithelioma; posteriorly it is bounded by compressed layer of tunica albuginea with several follicular cysts; ovarian tissue is present in the centre of the mass, and in front is the remains of the broad ligament; the Fallopian tube can be traced from the uterine cornu to the outer pole of the tumour, and, although flattened by pressure, is normal throughout.

Dr. J. W. BURNS (Liverpool) showed an

Ectopic Gestation in a Tuberculous Fallopian Tube

from a patient aged 26. Four years ago she was confined to bed with reputed appendicitis. Menstruation, previously regular, ceased after June, 1923; three weeks' bleeding in September was followed by irregular hæmorrhages till operation for a tender, fixed right appendage swelling; the left appendage was also slightly enlarged and fixed. Both appendages were removed on Dec. 3rd, 1923. Both tubes showed tuberculous lesions and the right one contained blood-clot with degenerate villi.

Dr. FLETCHER SHAW (Manchester) reported a case of

Perineal Hæmatoma during Labour.

The patient was a primigravida, 39 years of age, and the hæmatoma was first noticed soon after labour commenced. It rapidly increased in size, and when he was called in to see her it had formed a large swelling all over the perineum, up both sides of the vulva, and into the recto-vaginal septum. It formed such a large tumour that he advised Cæsarean section. There was slight albuminuria present. The patient did quite well for two days after the operation, and then the intestines gradually became more and more paralysed and the patient died on the fifth day.

Messrs. W. Gough, M. H. Phillips, Leyland Robinson, and J. St. George Wilson showed specimens and cases, and Mr. Wilson and Dr. Dougal showed instruments.

EDINBURGH MEDICO-CHIRURGICAL SOCIETY.

A MEETING of this Society was held in the New Gallery, Edinburgh, on May 7th, Sir DAVID WALLACE, the President, being in the chair.

Dr. JAMES YOUNG read a communication on

Further Investigations into the Cause of Cancer.

After referring to the fact that many observers had isolated organisms from cancer tissue by incubation,

Dr. Young went on to show how he had confirmed these findings and how his work would now seem to depend on the hypothesis that these organisms—yeasts, cocci, and bacilli—were different phases of the same parasite. This viewpoint was supported by extensive and rapidly growing evidence in recent literature. It had lately been shown possible to derive from cultures of the anthrax bacillus, yeasts, cocci, and branching filaments. In other words, these forms were to be regarded as merely phases in the life-history of the anthrax bacillus. Dr. Young suggested that as each phase could be rapidly stabilised and resist change, this had led to confusion in bacterial morphology. When a piece of cancer tissue was incubated in a test-tube the organism appeared in a variety of saprophytic forms derived from a phase so intimately locked up with the fresh tissue that it was ordinarily unrecognisable. Dr. Young demonstrated by means of micro-photographs what he believed to be the organism emerging from the cancer cell as plasm rods which went to form the inconspicuous and unstainable "plasm" or amorphous stage from which all the other organised types of the cancer organism were derived. He showed how the cocci, bacilli, or yeasts might develop from this plasm mass either directly or after passing through a second stage in which the "plasm" became encysted by a capsule rich in pigment. This he called the "sclerotical" stage. Hunter in 1892 showed that fungus elements were commonly found after incubating cancer tissue and a definite advance in the research had been accomplished by the discovery of this amorphous stage, which would seem to indicate that the parasite was definitely present in the cancer cell in this inconspicuous form, and, further, this form would appear to be toxi-potential. Dr. Young believed that the evidence he had brought forward supported the view that the cancer cell, like the tumour cell of plants, was a symbiotic compound of two living entities—the normal protoplasm and the parasitic plasm. In this connexion it was interesting to note that a plasm phase had recently been described in *Bacillus tumefaciens*, the causal organism of crown gall.

Discussion.

Prof. G. LOVELL GULLAND said that, as an old histologist, he doubted very much many of Dr. Young's conclusions for several reasons. It was well known that normal tissue when incubated often seemed to give rise to many strange forms of life—e.g., yeasts and cocci were commonly found—and he thought that, on further examination, many of the structures described by Dr. Young could be classified as products of degeneration. Cancer most commonly occurred on a free surface, and he suggested that, granted the presence of yeasts, as in cancer of the stomach, these might be of extrinsic origin. From the histological point of view he was always rather doubtful of unstainable material, and many, perhaps for this reason, were inclined to disregard it. Dr. Young, he thought, was inclined to place too much reliance on his "plasm" theory.

Sir HAROLD STILES described a visit to Irving Smith's laboratory where he had the opportunity of seeing for himself some of this worker's results with *Bacillus tumefaciens* in relation to crown gall. He had been much impressed, and though in the past he had spent time in endeavouring to disprove the organismal theory of cancer, he would now go so far as to say that he had quite an open mind on this subject.

Mr. DOUGLAS GUTHRIE read a paper, illustrated by lantern slides, on the

Styloid Process of the Temporal Bone: Its Variations and their Surgical Significance.

The two most frequent variations were abnormal length of the styloid process and the presence of a stylo-hyoid chain as in the lower animals. In the dog and horse the stylo-hyoid chain reached an advanced stage of development. In apes it was rudimentary, although the body of the hyoid bone was sometimes highly specialised so as to accommodate the laryngeal air sac. Man alone possessed a styloid process firmly ossified to the base of the skull. In the majority of instances those stylo-hyoid abnormalities were of purely anatomical interest, although occasionally cases occurred which gave rise to symptoms. A long incurved styloid process might project into the tonsillar region and thereby cause pain and difficulty of swallowing. After the operation of tonsillectomy, the tip of a long styloid might be found lying exposed in the tonsillar fossa. In the diagnosis the use of an X ray examination might prove helpful, and in regard to treatment the removal of the styloid was a fairly simple matter.

Mr. F. E. JARDINE then described a case where a medical man had mistaken this condition for a tonsillar calculus.

ABERDEEN MEDICO-CHIRURGICAL SOCIETY.

A MEETING of this Society was held on May 1st, Dr. G. M. DUNCAN, the President, being in the chair.

Dr. J. B. DUGUID read a paper on

Degenerative Conditions Found in the Aorta.

He stated that he had chosen the subject on account of the prevalent impression that atheroma was a condition found almost universally in the autopsies of those over 30 years of age. He had accordingly investigated the records of 100 consecutive post-mortem examinations, and noted the changes found in the aorta under the three headings of (*a*) atheroma, (*b*) syphilitic aortitis, and (*c*) superficial fatty change. Examinations in 48 cases showed no evidence of aortic degeneration, 27 showed definite nodular atheroma in varying degrees of severity, 11 showed definite syphilitic aortitis, 4 showed a state difficult to classify with certainty but suggestive of syphilitic disease, and 10 showed superficial fatty change. Of the total, 7 showed multiple changes. Dr. Duguid pointed out that the first group was not a collection of unusually young subjects, only 25 being under 40 years, and it was surprising to find so high a percentage of healthy aortas. In the 27 cases of definite atheroma the ages were between 55 and 74, and only one case of over 60 years showed no atheroma, from which one might conclude that atheroma was the disease of old age occurring in the aorta. After briefly describing the changes found in atheroma, the speaker indicated that it was a disease mostly affecting the descending aorta. Syphilitic aortitis was then described, and emphasis laid on the constancy with which it attacked the first part of the aorta with a more diffuse and more irregular destruction; and on the age-incidence, which was much lower than that of atheroma. From this, Dr. Duguid deduced that the lesion giving the so-called "murmur of old age" was unlikely to be a lesion of the first part of the aorta, as had been suggested, because the first part of the aorta was not the part commonly affected in the "disease of old age." In this deduction the state of the aortic valves was not considered, as the aortic orifice was regarded as a structure in the composition of the heart itself. The ten cases of superficial fatty change occurred in bodies of ages from 38 to 73, but this was not of importance, as the condition was found even in infants, especially in cases of death from burning. All but two of the cases observed had died from acute suppurative conditions, and the condition of the aorta could be regarded as an acute toxic state. The histology of the condition was described, and Dr. Duguid pointed out that, like the other definitely toxic condition, syphilis, it attacked often the first part of the aorta. From the infrequency of the incidence in the post-mortem room, he believed that this was a condition not specially related to atheroma or to syphilitic aortitis, and, further, that it was a disease capable of completely clearing up.

Exhibition of Specimens.

A demonstration of pathological specimens was given, the following being the exhibitors: Prof. J. Marnoch, Prof. T. Shennan, Mr. Alexander Mitchell, Dr. R. Richards: Specimens of surgical pathology. Dr. John Cruickshank: Photographs and specimens illustrating tumours in fish. Dr. Duncan: A series of microscopic slides of pathological states of the appendix. Dr. H. Edgar Smith: Specimens of tumours of the eyeball. Dr. Alexander Low: A series of stereoscopic photographs of various developmental anomalies in man and lower animals. A discussion of the exhibits followed.

Reviews and Notices of Books.

A TEXT-BOOK OF OPERATIVE DENTISTRY.

Fourth Edition. Edited by C. N. JOHNSON, M.A., L.D.S., D.D.S., F.A.C.D., Professor of Operative Dentistry, Chicago College of Dental Surgery. London: Heinemann. 1923. Pp. 1136. 60*s*.

IT is an instructive comment on the development of dentistry that this book, which is devoted almost exclusively to operative details, should extend to over 1100 pages without exhausting the subject. Indeed, the reader may feel that some very important branches of operative dentistry receive insufficient consideration, while others, such as the construction of crowns and bridges, are not described at all.

The book commences with an excellent description of the macroscopic anatomy of the teeth, and since a sound knowledge of the anatomy of the teeth is essential to successful conservative dentistry, such a section is a welcome feature. The illustrations are unusually good and convey the chief details admirably. A short account of the points of surgical importance appended to the description of each tooth would have added to the value of this section. In the account of the pulp it is stated that it does not contain lymphatics, and the writer goes on to say that this is of pathological interest. Schweitzer has, however, demonstrated the presence of lymphatics in the pulp, and his work has been confirmed by Dewey and Noyes, two American workers. There is an excellent chapter on asepsis in the operating room by A. E. Webster, which, if it be somewhat of a counsel of perfection, is none the less a sound and shrewd contribution. In this respect there is much room for improvement in dentistry. Though the days of the consulting-room which resembled a drawing-room are steadily passing, yet it cannot be said that the equipment of the average dental surgery has any logical relationship to the surgical principles on which dentistry is based. The chapter on cavity preparation follows on the lines laid down by G. V. Black and is in every way sufficient. The various filling materials and the methods of using them are described not too fully, but on the whole adequately, though we think that the allowance of two pages to silicate fillings is hardly sufficient. We do not find any mention of the method of using amalgam introduced by Sir Harry Baldwin, in which the amalgam is packed into wet cement. In this country the merits of this method in securing additional retention are widely recognised. A very full account of the technique of removing impacted third molar teeth is contributed by C. E. Kells. We are glad to note that the writer deprecates the routine extraction of the second molar as a preliminary to removal of the third molar. There can be no doubt that in the majority of cases it is unnecessary and gives little help. The special operation devised by Kells and described in detail appears to us to be needlessly complex and requires an unnecessarily large armamentarium.

The chapter on the difficult question of the treatment of pyorrhœa is disappointing. The author advocates the use of retainers for teeth which are loose. We had thought that the point of view which attempted to save teeth at all costs, irrespective of the pathological consequences of keeping teeth hopelessly loose through disease, had been abandoned. It belongs to the period when dentistry was a form of tooth carpentry and took little heed of pathology. More than half the book is taken up with an account of radiology and orthodontics. In America the majority of dentists have an X ray plant installed. In this country it is still comparatively uncommon for dentists to take their own radiographs. Yet the number is increasing, and no doubt this section of the book will prove a welcome one. The section on orthodontics is excellently written and sufficiently up to date to include an account of the muscle-training exercises devised by A. P. Rogers of Boston.

The book may be commended as a sound guide to the operations of dentistry.

THE ELEMENTS OF VITAL STATISTICS.

New edition. By Sir ARTHUR NEWSHOLME, K.C.B. George Allen and Unwin, Ltd. 1923. Pp. 623. 24*s*.

THE subject of vital statistics is not everyone's taste. Most people are content to leave it severely to those who either possess the odd capacity for enjoying it, or by some malignancy of fate are compelled to study it. Nevertheless, its importance is great. Only by examining records can the health of the community be measured and the effect of modern methods of life ascertained. Medicine without statistics would lose its clearest modern claim to rank as a science. So long ago as 1889 Sir Arthur Newsholme placed us in debt by writing a book on the subject which, after passing through several editions, was revised in 1899. Now he has entirely rewritten it and has added so much new matter that the book is more than twice the size of the original. It has become more a volume for the specialist who desires to be brought up to date in recent studies, than for the student making his first acquaintance with the subject. The most distinctive new element in the book is its appeal to American as well as to British readers, as evidenced by the introduction of much material drawn from United States Public Health Reports and other sources, material which is inclined to be overlooked in this country, and is convenient to have thus presented in compact form.

Familiarity with the earlier editions raised hopes that the author, now matured in experience and knowledge, would reach the height, only attained by the expert, of being able to make his subject attractive and appear simple to the tyro. New material and more trustworthy has appeared since 1899. The author has since then held high office in this country and has come into close touch with his American confrères. Nevertheless, the volume under review has in some respects not fulfilled our hopes. The student, attempting to grasp the geography of the forest of statistic fact, is likely to get more and more fogged by constant direction to seek elsewhere on page X or page Y in reports A to Z for further information; by doubts cast on the reliability of information when found; by difficulties presented to him in discovering by statistical method the meaning of national records. One chapter entitled Arithmetic of Elementary Statistics, but dealing with the modern methods, must be noticed unkindly. In the preface it is pointed out that the introduction of more elaborate methods has repelled many hygienists. There is little to wonder at in this, since the book before us is not the only one in which the subject is dealt with in a manner difficult to follow. Fundamental terms, such as "probable error," are not clearly defined. The "normal curve" is described as the form taken by the binomial $(p + q)^n$ when n is infinite. What inexperienced reader could follow this incomplete and not very accurate statement? On one page (p. 516), where an example is given of Poisson's formula, there are actually three arithmetical errors and then a comment is made that numbers must be large for the "formula to work," an expression quite inconsistent with the spirit of modern statistical methods, which is essentially logical. It is a pity this

chapter falls so far short of excellence, for the subsequent criticism of the application of the methods shows common-sense and might, therefore, lead readers to think that the methods themselves were faulty.

The scope of the book is wide, dealing as it does with all fields of life from birth to death, and discussing population and death-rates, infant mortality, marriage and fertility, infectious and industrial diseases, life-tables, housing and poverty, as well as statistical method and the graphic presentation of statistics. Possibly a more rigorous selection of material would have made the book more readable, but with the wealth of the material at the disposal of the author the difficulty of deciding what to put in must have been great. Throughout the book runs the theme that health and social prosperity move *pari passu*, whether the general death-rate be considered or its component parts, contributed by tuberculosis, infant mortality, or zymotic diseases. Fertility is presented as an exception; it is lowest where the social standing is highest, and is in inverse relation to mental activity; it is highest in the lowest social grades, and is in direct relation to physical activity. It is well that these generalities should be brought out.

LOCAL ANÆSTHESIA.

Its Scientific Basis and Practical Use. By Prof. H. BRAUN. Translated and edited by MALCOLM L. HARRIS, M.D. London: Henry Kimpton. 1924. With 231 illustrations. Pp. 411. 25*s*.

IT is ten years since the appearance of the first translation in English of Braun's famous text-book. This was from the third German edition, and now that the German version is in its sixth revised edition Dr. Malcolm Harris has thought rightly that a new English edition is required. The book is not much more extensive than before, but though slightly smaller in size is more closely printed. The main features, of course, remain the same, but there is a good deal of new matter. This is particularly noticeable, perhaps, in those parts of the text dealing with poisonous effects of local anæsthetics, prolonged experience having brought to light dangers that were not previously anticipated. Sometimes, too, these have become evident through novel methods of introducing local anæsthetics—for example, in splanchnic and in sacral anæsthesia. Apothesine, which is unmentioned in the last English edition, receives a considerable paragraph to itself in this one. The editor has done his work well. The original text is closely adhered to throughout, and when original matter not in the text is introduced the fact is made plain. The present edition will, we have no doubt, increase the already high reputation of Braun's work.

L'HÉLIOTHÉRAPIE À L'ALTITUDE.

By Dr. GERMAIN MATHIEU. Paris: A. Maloine et fils. 1924. Pp. 325.

THE purpose of Dr. Mathieu's book is to convince the medical profession in France of the necessity of making use of the combined sun and altitude treatment, which Rollier has proved to be so efficacious in surgical tuberculosis. The author has had the advantage of a long stay at Leysin and has collected a large amount of information affecting various aspects of his subject. He gives an exhaustive statistical study of the results obtained in Rollier's clinic during the period 1913–1920. The plan of giving the proportion of patients cured during each half-year of treatment is a good one, as it affords an idea of the probable duration of treatment in each type of case. The functional condition of joint lesions after arrest of the disease is also dealt with and in most cases is surprisingly good. Some 20 pages are devoted to the subject of heliotherapy in pulmonary tuberculosis; in this chapter Dr. Mathieu reaches the conclusion that sun treatment, if properly carried out, is definitely beneficial and does not increase the risks of hæmorrhage and congestion. He attributes the disappointing results hitherto obtained chiefly to the spasmodic and pusillanimous way in which this treatment has been carried out, and to the lack of knowledge regarding the type of case in which it is indicated. No such brilliant results are likely to be obtained as in surgical cases, and the extra supervision necessary has made medical officers of sanatoriums unwilling to embark systematically on this form of treatment.

In subsequent chapters Dr. Mathieu deals with the technique of heliotherapy and gives a large number of meteorological data chiefly derived from Dorno; he finally enters into an interesting discussion concerning the mode of action of the sun-bath. Although this problem is at present incapable of solution, the facts of the case are presented in such a way as to provide plentiful stimulus to thought. The old view, that the curative action of sunlight was due mainly to the ultra-violet rays, lost ground when it was found that they were unable to penetrate more than 1/10 mm. of skin. Rollier's theory that cutaneous pigment might transform these rays into ones of longer wave-length has no foundation in experiment. On the other hand, the recent discovery that it is the ultra-violet rays that are most effective in the prevention of rickets, has again swayed opinion in the direction of the shorter wave-lengths.

The action of light in increasing the ease with which hæmoglobin parts with its oxygen, together with the high penetrating power of the visible rays (which are capable of raising the temperature of the subcutaneous tissues to 116° F.), is thought by Dr. Mathieu to account for the increase in metabolism and the marked muscular development so characteristic of the sun treatment. The fact that a high degree of immunity is developed in specific fevers accompanied by rashes suggests that the protective function of the skin may not be confined to preventing the germs of disease from entering the body, but may also be concerned with the production of antibodies as a second line of defence. Rollier's observation that the pigmented skin was unaffected during an outbreak of chicken-pox, Leuba's failure to make vaccination "take" on pigmented skin, and the fact that tuberculous patients who pigment well tend to have a good prognosis are given in support of the theory that a healthy, pigmented skin raises the immunity of the body.

In attempting to assess the relative importance of the various factors concerned in the helio-alpine treatment, Dr. Mathieu broaches a very difficult subject. His conclusion, "on clinical grounds," that sunlight is by far the most important factor is not supported by sufficient evidence to make it at all convincing; especially as no mention is made of the increase in metabolism caused by exposure of the surface of the body to cold air.

MEDICAL HISTORY.

Magistri Salernitani Nondum Cogniti. A Contribution to the History of the Medical School of Salerno. By Dr. PIETRO CAPPARONI. With a Foreword by Sir D'ARCY POWER, K.B.E., F.R.C.S. Eng., &c. London: John Bale, Sons and Danielsson, Ltd. 1923. Pp. 65. 15*s*.

THIS volume forms No. 2 of the Wellcome Research Studies in Medical History. Everything connected with Salerno is of interest to the medical profession, and we congratulate Dr. Capparoni on having made such notable additions to the already published and valuable researches of De Renzi and Piero Giacosa. Dr. Capparoni tells us that while on military duty at Salerno in 1916 he had the opportunity of studying an MS. belonging to the library of the Cathedral of Salerno. It contained the Liber Confratrum and an obituary of the Confraternity of the Cruciati which was founded during the Middle Ages in the chapel of St. Michael in the cathedral. Part of the MS. goes back to the latter half of the eleventh century. A number of names are those of medical men, some again of them being those of Scotsmen and Englishmen, and it was this fact that led Dr. Capparoni to make a

careful examination of the MS. From these documents and sundry others he was able to obtain the names of 31 medical men unknown to De Renzi and additional details about 36 masters already known to him. Before entering on a description of the MS. and his researches therein, Dr. Capparoni gives a most interesting historical review of Salerno and its medical school which probably began somewhere about the eleventh century, though there had been a hospital as early as the year 820. The largest hospital was that founded by Matthew of Aiello in 1183. The five periods into which the history of this great school was divided by the late Prof. Modestino del Gaizo are as follows: (1) The Monastic Hospital and perhaps scholastic period (before 1000); (2) Renaissance of Classical Medicine (between 1000 and 1150); (3) period of popular hygienic medicine (twelfth century); (4) period of creation of surgical schools (thirteenth century); (5) period of decadence (from fourteenth century to 1811). The dates of the various scripts in the MS. run from about 1073 to the sixteenth century.

Dr. Capparoni has conferred a real benefit upon all those interested in the history of medicine. He gives his readers a number of illustrations reproduced from photographs of various leaves of the MS. and of other documents in the Cathedral of St. Matthew. Transcriptions of portions of many of these are given in a documentary appendix, and the only fault which we can find with the book is that the transcriptions have not attached to them the number of the plate to which they refer; this makes it difficult for anyone not an expert in palæography to identify them. However, Plates 7, 8, 10, 22, 23, and 25 are fairly easy to identify, although the script, owing to necessary reduction, is very small. Among other illustrations are a view of Salerno as it is to-day and two of the pulpits in the cathedral, most beautiful structures in Cosmato work. The first illustration (p. 34) also shows a magnificent Paschal candlestick in the same work. Altogether, the book is a joy both to read and to look at.

CONSTRUCTIVE CONSCIOUS CONTROL OF THE INDIVIDUAL.

By F. MATTHIAS ALEXANDER. With an Introduction by Prof. JOHN DEWEY. London: Methuen and Co. 1924. Pp. 317. 10*s.* 6*d.*

Prof. Dewey in his introduction, whilst admitting that Mr. Alexander's principles and procedure are hard to understand and accept, still leaves us in danger of rejecting them for their incomprehensibility. Man, we are told, cannot meet the complexities of civilised life because of his lack of sensory appreciation of his own movements. This is to be remedied by unlearning his bad habits and paying attention to the "means whereby" rather than to the "end in view," and this process is constructive conscious control, to be achieved by a course of training and manipulation at the hands of a teacher. It is not easy, by reading alone, to grasp how by this procedure what Prof. Dewey calls the greatest of all tasks can be executed—the task of rescuing mankind from "all but a universal state of confusion, discontent, and strife." Mr. Alexander is possibly an intuitionalist who arrives at conclusions valid for himself and those to whom he conveys his enthusiasm, and the conclusions of such a one cannot always be set forth in a manner convincing to others.

JOURNALS.

QUARTERLY JOURNAL OF MEDICINE.—The April number contains the following articles: The Variations in Gastric Secretion of the Normal Individual, by James R. Bell and William MacAdam. Observations conducted by means of fractional gastric analysis, on 20 consecutive days, upon the same normal individual under similar conditions led to the conclusion that a single fractional test-meal may not afford a typical representation of the true state of gastric secretion.—Arterial Elasticity in Man, by J. Crighton Bramwell. Observations were made upon the arterial elasticity both in health and disease, and the effects of variation of this function upon the circulation as a whole. Diastolic blood pressure is an important factor in determining arterial elasticity, which rapidly diminishes as the diastolic pressure rises. In arterial disease the elasticity becomes impaired, and its characteristic relationship to the pressure is no longer present.—Studies in Calcium and Phosphorus Metabolism: Part III., The Absorption of Calcium and Phosphorus and their Fixation in the Skeleton, by S. V. Telfer. Osteoporosis and rickets-like changes in the bones of puppies resulted from a dietary deficient in calcium but containing an adequate supply of phosphorus. The addition of calcium lactate alone to such a diet was sufficient to cause a normal skeletal development. Various factors concerned in the normal absorption of calcium and of phosphorus are discussed, and the fixation of phosphorus in the bones was found to be dependent upon the retention of calcium.—Renal Glycosuria: A Clinical and Metabolic Study, by F. G. Finley and I. M. Rabinowitch. Six cases of renal glycosuria which were observed at the Montreal General Hospital are described. These formed 2 per cent. of a total of 275 consecutive cases referred to the metabolic clinic as diabetics. The article closes with some observations upon carbohydrate metabolism.—The Association of Blue Sclerotics with Brittle Bones and Progressive Deafness, by William Stobie. Fragility of bones occurring in association with a dark blue discoloration of the sclerotics was first recorded by Eddowes in 1880. The author gives details of cases since published, and proceeds to describe a family in certain members of which this peculiarity existed, together with otosclerosis. The anomalies are transmitted directly, occur in males and in females, and do not appear to shorten life. The deafness does not usually appear before the second or the third decade. The colour of the sclerotics is well shown in the plate.—The Inorganic Phosphorus Content of Cerebro-spinal Fluid, by Henry Cohen. The normal inorganic phosphorus content was found to be 1·25 to 2 mg. per 100 c.cm. A definite increase occurs in meningitis, but not in encephalitis lethargica. In chronic diseases of the nervous system the increase is very slight. The rise in the acute forms of meningitis is thought to be due to a greater permeability of the cells of the choroid plexus.—The Proteins of the Serum in Cancer, by E. L. Kennaway. Loeper described in 1920 an increase in the globulin in blood serum in cancer. This excess is believed to be derived from the tumour. The author has made observations on 104 cases, including carcinoma, non-cancerous conditions, and normal individuals. He finds that in some advanced cases of carcinoma there is an increase in the serum globulin greater than that found in other conditions. Equally advanced cases, however, may show no such change. No operable case was met with in which the amount of globulin was abnormal. The method does not therefore appear to be one of diagnostic value.—A Clinical Blood Coagulometer, by Owen S. Gibbs. The principle of the new type of blood coagulometer described consists "in forming a bead of blood on a thin wire, which on being tilted allows the bead to run up and down . . . , at the moment of coagulation the bead stops and adheres to the wire." Contact of the blood with the body tissues shortens the coagulation-time, but this is not so in hæmophilia. Addition of fresh tissue juice or serum from an animal to hæmophilic blood causes coagulation at practically normal rates. The apparatus is illustrated by means of a plate.

THE LATE DR. W. A. PINNIGER.—The death occurred very suddenly at Brighton, on May 2nd, of Walter Augustus Pinniger, M.R.C.S., L.R.C.P. Lond., who had been in practice in Brighton for over 30 years. He was actively associated with the Brighton, Hove, and Preston Provident Dispensary for many years, and had an extensive private practice. Aged 74, he had only recently gone into retirement. Following a service in St. Margaret's Church, where he had been a sidesman and a trustee, the remains were interred in the Brighton and Preston Cemetery.

Reports and Analytical Records.

ADALIN; BUTOLAN; OPTARSON; THEOCIN SODIUM ACETATE; LUMINAL.

(BAYER PRODUCTS LIMITED, 1, WARPLE-WAY, UXBRIDGE-ROAD, LONDON, W. 3.)

Adalin (bromdiethylacetylcarbamide) is an almost tasteless and odourless sedative and hypnotic and is recommended for use in cases of neurasthenia and such nervous conditions as are found before minor operations. Its safety is suggested by the fact that while the normal dose as a sedative is one to two tablets of 5 gr. each three or four times daily, and as a hypnotic two or three tablets half an hour before bed-time, as much as 125 gr. have been taken in a single dose without any undesirable effect other than protracted sleep. As a rule, it is well borne by the gastro-intestinal tract, while it does not seem to depress the heart. The tablets can be taken in a little cold water when prescribed as a sedative, and with a hot drink, the nature of which is ordered by the physician, when prescribed as a hypnotic.

Butolan. This is a brand of carbamic acid ester of p-oxydiphenylmethane, and is used as a remedy for oxyuriasis. In its ordinary form it is a crystalline powder almost insoluble in cold water and is practically tasteless. No disturbance of the digestive tract has been noticed after its administration, and animal experiments have shown that the ingestion of huge doses produced no ill-results. The active principle of butolan kills the oxyuris within five minutes in a 1/4000 dilution. The preparation is sold in compressed tablets of 7½ gr. each (0·5 g.), and the adult treatment is one tablet taken three times a day for a week. The course should be followed by an aperient. The average dose for children is half a tablet and for infants a quarter of a tablet, but children of 10 years may take the adult dose. In obstinate cases two courses of treatment may be necessary, but the second should not commence till eight days after the end of the first course, leaving time for the eggs of the parasite to mature.

Optarson is an amino salt of heptin chlorarsenic acid, containing about 30 per cent. of arsenic, and strychnine, its use being indicated in nervous conditions, exhaustion, and in convalescence following infectious diseases. Its tonic action is not attended with any signs of local irritation and no unpleasant odour is imparted to the breath, while its efficacy is prompt and increases with the progressive action of the arsenic. The remedy is supplied in packages containing 12 ampoules of 1·2 c.cm. solution, and the general dose is 1 c.cm. every other day by hypodermic injection. In delicate persons the injection should be given only twice a week to commence with.

Theocin sodium acetate (soluble theocin) is a synthetic reproduction of an alkaloid occurring in minute quantities in tea-leaves and possessing marked diuretic properties. It is closely allied to theobromine, and has distinctly diuretic effects. The dose of theocin sodium acetate is 2½ to 5 gr. two or three times daily dissolved in water, but it can also be given intravenously or in suppositories. The drug is supplied in bottles of 1 oz. and ½ oz., and in tubes containing 20 1½ gr. tablets.

Phenylethylmalonylurea, having the descriptive name phenobarbital, and the registered name "Luminal," is a synthetic hypnotic and sedative which occurs as a white powder with a slightly bitter taste and is almost insoluble in water. The Bayer brand is supplied in powder in ½ oz. and 1 oz. cartons, in ¼ gr. tablets in bottles of 100, and in 1½ gr. tablets in bottles of 50, and also in tubes of various quantities and strengths. In the treatment of epilepsy luminal has established itself even more widely on the Continent and in America than in this country, but we may recall that not long ago in our columns[1] Dr. Gordon Holmes confirmed the benefits that can be obtained by its use, particularly in idiopathic major epilepsy. The drug is first-cousin to veronal, and, like all sedatives, will reduce the number of convulsions in epileptics if given in large enough doses. In fact the ideal drug being one with the maximum anti-convulsive and minimum sedative effects, luminal, of all preparations, comes nearest to what is required. The drug is contra-indicated where there is great debility, arterio-sclerosis, marked pulmonary or cardiac disease, and nephritis. Even small doses should be employed cautiously. In epilepsy, the dose for which varies according to severity and frequency of attacks, the drug may be taken, apparently, for an indefinite period, the average dose for an adult being 1½ gr. given at night and in the more severe types 3 gr. or more daily. For children the dose is proportionately smaller, as it is when employed as a sedative.

[1] THE LANCET, 1923, i., 502.

"TABLOID" NUCLEO-LECITHIN COMPOUND.

(BURROUGHS WELLCOME AND CO., SNOW HILL BUILDINGS, LONDON, E.C. 1.)

This substance is an addition to the comprehensive series of compressed products issued by this firm. It is a compound, in which nuclein, lecithin, and the glycerophosphates of calcium and potassium are combined in the following proportions:—

Nuclein	gr. ¼
Lecithin	gr. ½
Potassium glycerophosphate	gr. 1
Calcium glycerophosphate	gr. 1

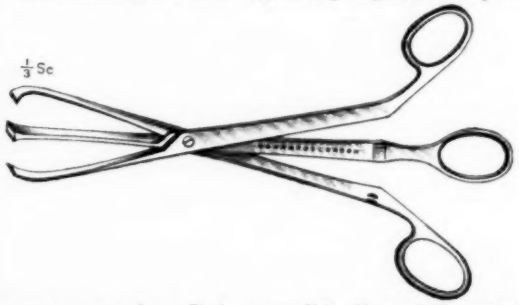
Nuclein has been claimed to possess a stimulating action in the formation of white blood corpuscles, thus raising the opsonic index and acting as a bactericide. The qualities and uses of lecithin are well known. The addition of the glycerophosphates of calcium and potassium is designed to exert a special selective action on the nervous system.

"Tabloid" Nucleo-Lecithin Compound is sugar-coated, so that the lecithin component is well disguised and at the same time protected from deterioration due to atmospheric action. The compound may be administered with any diet as a restorative, nutrient, and reconstituent in nervous and nutritional disorders. The drug is supplied in bottles of 25 and 100.

New Inventions.

A NEW THREE-BLADED PERITONEUM FORCEPS.

THE instrument here illustrated will be found useful in grasping and bringing two raised peritoneal folds into position for suture, in an anastomosis, in sinking a bowel stump, or in invaginating a gastrostomy or



cæcostomy tube. It is a modification of Pannett's three-bladed peritoneum forceps, the crushing blades of which are restricted in use to the parietal peritoneum. The multiple-toothed, non-crushing grip of Stiles's peritoneum forceps has been substituted for the crushing blade of Pannett's instrument.

Messrs. Down Bros., Ltd., St. Thomas's-street, London, S.E. 1, are the manufacturers.

Sheffield. THOS. B. MOUAT, F.R.C.S. Eng.

THE LANCET.

LONDON: SATURDAY, MAY 17, 1924.

BIOCHEMISTRY.

CAMBRIDGE put on scarlet on Friday last to greet the Chancellor, to do honour to a great and well-loved teacher, and to open the new biochemical laboratories. Everyone will applaud the discretion of the trustees who have chosen the provision of an ample material field for the development of Prof. HOPKINS's activities as the best way of carrying out Sir WILLIAM DUNN's direction that his estate should be used "for the alleviation of human suffering." We are reminded of the simple motto which guides the benefactions of the Rockefeller Foundation—"the well-being of mankind throughout the world"—and it is a signal encouragement to the profession that the development of medicine along the broadest lines should be so generously recognised as one of the most hopeful roads towards human betterment.

No one need be very old to remember the time when biochemistry was not. Thirty years ago the English student of physiology was exhilarated by Dr. WOOLDRIDGE'S translation of Bunge's Lectures which was published in 1890, and wondered at the erudition of Prof. HALLIBURTON'S "Text-book of Chemical Physiology and Pathology" which appeared in the following year. There was a general feeling that those who sought to understand the working of the body ought to know its chemical composition as well as its minute anatomy, and courses of physiological study followed a rough grouping into experimental, chemical, and histological sections. Chemists as a whole were contemptuous of the messy slimes associated with life, though a change of heart was adumbrated by amiable disputes as to the relative merits of "chemical physiology" and "physiological chemistry." The mechanistic physiology of the nineteenth century was reaching its culmination, the impetus of DARWIN on biological studies was beginning to fade, and with the remarkable advances made by organic chemists in elucidating the chemical structure of some of the complex compounds associated with life a frame of mind arose which was convinced that the real key to the riddle of the difference between live and dead things lay in a knowledge of the chemistry of animate beings. The new impetus in inquiry was appropriately celebrated by a fresh word and "biochemistry" came into being, definitely perhaps in this country by the establishment of the *Biochemical Journal* by BENJAMIN MOORE and Mr. E. WHITLEY in 1906. And in these last 20 years it has been everywhere one of the most active and productive—quantitatively if not always qualitatively—of the departments of natural knowledge. The dream that it would quickly unlock the mystery of life has naturally not come true; it has perhaps not made any progress in that direction, it has sometimes even deflected the search into fruitless lines. Minute anatomists at one time felt sure that if only they could make the microscope magnify enough they would see life itself going on. But if biochemists and microscopists have both failed to realise their ideals, their energetic and enthusiastic pursuit of them has led to immense progress in method and knowledge.

The importance of biochemistry seems to lie in two directions. We still have the old distinction between "physiological chemists" and "chemical physiologists," between, for example, those who study the fate of β-phenyl-iso-butyric acid in the body in terms of its chemical constitution, and those who examine the influence of a cow's diet on the anti-rachitic value of its milk. But the enormous gain in the existence of a more or less independent discipline of biochemistry is that both groups of students now work in the same building, belong to the same society, and publish their results in the same journal. Biochemistry, in short, achieves what is so much needed in these times—a union and collaboration between two sections of scientific workers instead of a segregation and separation which has been the unfortunate result of the modern expansion and development. And it does this in the most effective way by its very nature, and without any of the useless scheming for coördination and integration of which so much is heard and so little seen. The chemist and biologist now lie down together; they desire knowledge and ensue it. And if physiological chemistry has not explained life it has made a surprising amount of progress in explaining the mechanisms of live animals and plants and how they work, partly along the lines of classical chemistry, more particularly in the field where the commingling of chemistry and physics shows again the fruitfulness of natural coöperation. That many harassed minds have found as much comfort in "colloids" as the old lady did in "Mesopotamia" does not detract from the really substantial progress in our understanding of how the body works which has been attained by knowing something of the properties of particles too big to be molecules, too small to be pieces of stuff. And in the same way the chemical physiologist has pushed forward with detailed explanations in almost every department of biology, and not least in the normal and abnormal human physiology which is the special concern of medicine. No further evidence is needed of the utility of the theory and practice of bio-chemistry in medicine than the change which has come over clinical laboratories in about the last 15 years. To the outfits for histology and bacteriology there is now everywhere added the armamentarium and the vocabulary of the chemist. The progress of bio-chemistry has been so ample and sound because it has begun and gone forward on a broad and generous basis, comparative as well as human, detached from, and yet intimately connected with, technology, furnishing food for the spirit as well as for the body. There is every prospect that in its new home at Cambridge it will continue its comprehensive career of catholic interests.

THE USE OF THE GALL-BLADDER.

WHEN surgery becomes necessary in the treatment of gall-bladder disease the question more frequently than not arises as to the advisability of removal of the organ. Controversy on this subject has existed since the birth of gall-stone surgery, yet even now a completely satisfactory answer is not forthcoming. It is the old dilemma in which the surgeon is so often placed. He is called upon to take some active measure in the treatment of a disease which has already proved itself refractory to non-operative treatment; yet knowledge of the physiology, let alone the pathology, of the organ with which he has to deal is sadly wanting. Under these circumstances the evolution of the treatment of gall-bladder disease

has been necessarily and commendably slow and cautious. Only now are such authorities as Sir Berkeley Moynihan and Mr. James Sherren, after observation extending over many years, able to recommend with confidence the excision of the gall-bladder in certain pathological conditions. The feasibility of this operation, on theoretical grounds, must obviously depend upon two considerations: whether the gall-bladder performs any important function in the physiological economy, and whether, should it be removed, its work can be vicariously performed by some other structure in the organism. The answer to the latter question has been given to this extent: many persons from whom the gall-bladder has been removed have lived long and apparently normal lives. They are free from the disturbances for which they sought aid, they have been restored to health. Progress, however, in the elucidation of the normal activities of the gall-bladder has been very slow. Only quite recently can it be said that any real knowledge has been gained. So resistant has this problem been to the attack of the investigator that many have held that the gall-bladder subserves no important function at all, that it is in fact an organ destined to disappear during the course of evolution, a structure which has outstayed its uses, assumed no new rôle, and has become rather a menace than a help to the organism.

The lecture[1] delivered before the American College of Physicians by Dr. J. E. SWEET, Professor of Surgical Research in the University of Pennsylvania, and now reprinted, forms an admirable example of the manner in which such problems should be attacked. He points out how important it is in a problem of this kind to approach it from every point of view. Its development, its structure, its comparative anatomy, the changes which take place when it is removed, all are capable of shedding light upon the physiological work of any organ. As to development, the gall-bladder is formed from the same group of ancestral cells which gives birth to such important structures as the stomach, duodenum, liver, and pancreas. From the way that it is disposed so that the fundus is lower than the apex, from the fact that the cystic duct is obstructed not only by being bent, but by the presence of mucosal valves, it is clearly seen that it is much easier for bile to enter its lumen than to escape. It does not look as though the contents were ever meant to emerge by way of the cystic duct. Nor have any experiments ever devised to demonstrate active expulsion by the contraction of its walls succeeded in doing so. The mural muscular tissue in microscopic section appears much more allied to the muscularis mucosæ than to the proper muscular coat of the intestinal wall. It is probably concerned with movements of the mucosa to facilitate absorption. The submucosa of the gall-bladder is unusually richly supplied with lymphatics, implying the possession of a strong absorptive function. This, indeed, the gall-bladder has been proved to exert by the experiments of Mann at the Mayo Clinic. Prof. SWEET calls attention to the little parietal sacculi seen in the extra- and intra-hepatic ducts described by Thiele, which Beale in 1889 regarded as supplementary gall-bladders. It is interesting to read that they are more numerous and bigger in those animals which do not possess a gall-bladder, as is also the fact that after cholecystectomy they increase in size and number. Prof. SWEET brings forward evidence to show that the gall-bladder is occupied with the metabolism of fats, so that one function at least seems definitely to have been assigned to the gall-bladder. It was always difficult to believe that an organ with such a very differentiated structure served only as a reservoir. The enigma of the gall-bladder, like other physiological problems, seems gradually to be yielding to well-planned experimental attack.

[1] The Gall-bladder: its Past, Present, and Future. Reprinted from International Clinics, vol. i., Series 34.

RESEARCH ON DISTEMPER.

THE council appointed to administer the *Field* Distemper Fund, which has been instituted to further the investigation of this baffling disease in dogs, has recently issued a second report, which includes the recommendations of the Technical Scientific Committee presided over by Prof. C. J. Martin, F.R.S. The report sets out the encouraging financial support which has already been accorded to the scheme. It was estimated that £25,000 would be required in the first three years: about £9500 was received during the first year (1923), and future annual subscriptions to the amount of £3400 have been promised. The fund has therefore made a good start, but continued support will be needed if the investigation is to have a reasonable chance of success. After some delay, for which the council was not responsible, the specially isolated and equipped kennels and laboratories have been completed, and it is expected that the work in the isolation compound will begin forthwith. The first undertaking in this department concerns the breeding in isolation of healthy puppies for experiment.

The Medical Research Council is taking a large share in the investigation by allowing a part of its farm to be used for the premises designed for the research, and also by affording the veterinary experts the coöperation of the members of the scientific staff of the Hampstead Institute. This arrangement is a very suitable one, and will no doubt prove a fertile combination, since pathological problems in man and animals are largely identical. A number of human diseases are awaiting illumination derivable from animal experiment, but this help can only come indirectly, since the morbid states chiefly concerned are confined to man. The information which it is expected will accrue from the study of distemper, however, is expected to throw light on human disease, not only because distemper resembles in many ways influenza, measles, and such "zymotic" diseases, but because the basis of pathology as a whole will be widened. The experimental work of infection of animals with distemper has not yet begun, but preliminary work has already yielded interesting results, and the study of filter-passing viruses in general has been under survey, especially with a view to artificial culture. In spite of the fact that recent writers on distemper (Ferry, McGowan, Torrey, 1910–13) have pronounced after extensive investigations in favour of the *Bacillus bronchisepticus* as the cause of the disease, expert opinion has by no means entirely accepted this verdict, and an ultra-microscopic virus such as Carré believed that he had established has received wide support. The main reasons for this attitude of scepticism towards the bacillary hypothesis have been three: (1) the great difficulty which investigators have experienced in isolating experimental animals, so as to avoid unforeseen sources of infection which would render the results of inoculation open to question; (2) the somewhat indefinite characterisation of the bacillus in question, as distinct from other widespread strains or species—e.g., *B. fæcalis alkaligenes;* (3) the rather incomplete picture of the disease following the inoculation of cultures.

During the past few months 23 cases of typical canine distemper occurring in the London area have been examined post mortem by Mr. R. E. Glover, M.R.C.V.S., in the laboratories of the National Institute for Medical Research, and *B. bronchisepticus* has been sought in the various organs. It was only

found in a small fraction of the cases; twice it was isolated from the tracheal mucous membrane of the 23 dogs examined, and three times from the broncho-pneumonic lungs present in 17 of the animals. It cannot be said that this finding definitely negatives the bacterial theory of distemper, but a repetition of such a result on a larger scale might bring the matter much nearer settlement. The bacillus is easily cultivated, and consequently negative evidence as to its occurrence has a definite value. If the relation of *B. bronchisepticus* to distemper is not causal but only accidental or of the nature of a secondary infection, other localised epidemics unaccompanied by this bacillus are not unlikely to occur. The recent experience of Shoicho Kondo (1923) in Japan, however, again supports the claim of *B. bronchisepticus*. This worker was able to transmit the disease by inoculation of lung juice, but not when this had been filtered. From the affected lungs of 54 dogs suffering from distemper he isolated the bacillus 46 times, and believed that he gave the disease by injecting pure cultures. The same criticisms might be made of his work as of that of the writers quoted above, but since his paper is at present only available in abstract these would be premature. A world-wide association of *B. bronchisepticus* and distemper makes a strong suggestion of a causal relationship, but the history of an epidemic carefully investigated without the discovery of the bacillus would afford even more convincing evidence in the opposite sense. The great difficulties associated with the search for an ultra-microscopic virus are being seriously tackled at the laboratories of the National Institute for Medical Research with the very complete resources at the disposal of the scientific staff. An attempt is also being made to throw light on the epidemiology of distemper by the systematic collection of reports of outbreaks with a view to their statistical analysis.

Annotations.

"Ne quid nimis."

THE ORIGIN OF THE LARYNX.

THE larynx and the voice have been connected at least since the times of Aristotle and Hippocrates, and, in all probability, for centuries before their period. Galen described and named the laryngeal cartilages, gave an account of the muscles, and pointed to the glottic ligaments as the chief organ of the voice. We to-day are in the habit, in general, of talking of the larynx as the organ of the voice, and perhaps of implying indefinitely that the part came into being to serve the function of vocalisation. But teleological reasons for existence, although often and perforce admitted, cannot be estimated in terms of evolution, and it is well to be reminded that the larynx is not only the organ of voice, and to realise, from consideration of facts such as were brought forward in the Arris and Gale lecture by Mr. V. E. Negus (see p. 987) that it did not come into existence primarily as a sound-producer, nor was it evolved from its beginning in association with the growth of powers of vocalisation; it began life as a simple sphincteric valve at the entrance to the air-sacs or lungs, and it developed its other uses, by degrees, on top of its primary function. This way of looking at the larynx, of course, is not new, but Mr. Negus has brought forward some fresh matters which, as will be seen in his lecture, introduce new problems for consideration. The organ by means of which the voice is produced is undoubtedly the larynx, but many animals possess an instrument capable, to all appearances, of producing a range of tones like the human voice—yet they do not produce it. The difference between them and us lies, not in the instrument, but in the higher nervous connexions and the mentality, and the larynx is in reality but a structure which, owing to its convenient situation in the air-stream, has been utilised by the higher centres to serve this function in addition to its other and more primitive duties. It is interesting to note in this connexion that the human larynx is really a very simple structure. As in many other parts of the body, the brain has taken possession of a rather primitive instrument and has made it serve purposes which, without the guiding and governing brain, would call for much specialisation and intricacy of structure. Primitiveness and absence of specialisation are also of great value, almost of necessity, in the evolution of any organ up to the higher possibilities open to it. This primitive simplicity of the larynx, suggested at first by consideration of other types, becomes perhaps more apparent when we study its development. Mr. Negus has described the simple sphincter found in the primitive lung-fishes, and this simple sphincteric arrangement of developing muscle is found also in the young human embryo, surrounding the entrance to the air-way of the lungs. The sphincter is hardly disturbed by the formation of the cartilages; it is cut up into parts by their extension into it, but there is very little displacement of cells or fibres, and even in the adult larynx the sphincteric arrangement is still quite visible to those who look below the surface appearances of the muscles. The lower part of the larynx, the part below and including the glottis, is still primitively simple, and if its muscles do not act like a sphincter, it is only because the cartilages interfere mechanically with such an action. This is the part of the larynx more particularly concerned in voice production, the part which started its evolutionary career as a valve. The supra-glottic portion of the larynx is not derived from the walls of the air-tube, but is a modified part of the floor of the pharynx. Its development, away from the middle line, could have had nothing to do with the central and quite efficient valve, and its formation was a secondary and later one. Mr. Negus maintains that these pharyngeal structures were evolved in connexion with increasing efficiency in olfaction and deglutition after mastication. They are certainly of little direct value in phonation, although they may indirectly help in the performance of that function by relieving the region concerned of some of the burdens entailed by its more primitive duties. However this may be, it is of some interest to observe that the embryological and phylogenetic distinction between the lower and upper larynx has its reflection in the different lymphatic drainages of these two regions, as well as in other particulars. We cannot here follow Mr. Negus into many of the interesting possibilities which he has opened before us, but we may refer to one of these—the effect of the incomplete opening of the glottis in respiration on the intrathoracic pressure. The lessened intrathoracic pressure claimed as a result of this is no doubt an addition to that "negative pressure" which must exist normally in this region, as in the mediastinum, at all times. The naturally dilated condition of the thoracic œsophagus during life is an indication of this "negative" mediastinal pressure, and the alterations of pressure, described by Mr. Negus as producing certain effects on the pulmonary and aortic circulations, are perhaps to be regarded as curves of variation in the more constant and continuous effect which the mediastinal condition must produce on the venous inflow.

SODIUM SALICYLATE FOR ENCEPHALITIS LETHARGICA.

IN view of the prevalence of mild encephalitis at the present time, and the absence of any recognised successful form of treatment, the report of a case in a recent number of the *Bulletins et Mémoires de la Société Médicale des Hôpitaux de Paris* (April 10th, 1924) is of interest. A woman 21 years of age was admitted to hospital diagnosed as suffering from this disease, examination of the cerebro-spinal fluid revealing no abnormalities. An intravenous injection of 1 g. of sodium salicylate in a solution of 1 in 30 was

given on the day of admission, and six days after the onset of the first symptom. Two days later the somnolence had disappeared and the headache, which had previously been very acute, was much less. The next day 2·65 g. were injected intravenously and salicylates were detected in the urine. The patient's condition remained satisfactory. Two days later, no further injection having been given, the somnolence had returned and was as marked as on admission, and the headache had reappeared. Myoclonic movements were beginning. Three grammes of sodium salicylate were thereupon injected intravenously, and within two hours the symptoms had disappeared. Attempts were made during the next few days to prevent the recurrence of symptoms by giving the drug by mouth, but without success, and recourse had to be made again to intravenous injections of 2·5 g. daily. After four more days all the symptoms had disappeared and they did not return after discontinuance of the drug.

THE MANCHESTER RADIUM INSTITUTE.

THE annual report of the work done at the Manchester and District Radium Institute during the last year has just reached us. The number of patients who presented themselves for treatment was slightly larger than in the previous year, being 829. Of these, 664 proved to be cases of malignant disease, while the remaining 165 suffered from various non-malignant diseases. During the same period a large number of radon plates and tubes were prepared by the physical staff attached to the Institute, and as some more radium has lately been purchased more emanation will be available for use next year. Dr. Arthur Burrows, radiologist to the Institute, states that 64 cases of malignant disease, exclusive of rodent ulcer, were rendered free from symptoms and signs of disease during the year. The result is satisfactory enough as far as it goes, but many of these cases can only have been treated within a few months of writing the report, and the question of permanent benefit must be judged after a longer interval of time. A laboratory for research has just been built and fitted up. This is a most important and necessary adjunct to any institute or hospital where the treatment of cancer is carried out with radium, and the two departments will be able to work in close conjunction.

Diathermy appears to give satisfactory results at Manchester, and is used in many cases of carcinoma, particularly in large fungating growths of the breast, tongue, and vulva. The method employed is to burn away as much as possible of the growth and then thoroughly to irradiate the surrounding tissues and the neighbouring lymphatic glands. Dr. Burrows states that after the main mass of growth has been excised by diathermy from the breast, he inserts radium tubes along the lymphatic channels into the axilla, with excellent results. He does not describe his technique for carrying out what must necessarily be a difficult procedure. We learn from the report that good results have followed the treatment of carcinoma of the tongue by the burying of unscreened emanation tubes into the growth, but no details are given as to the form taken by these tubes. Are they minute glass "seeds" which are inserted and then left indefinitely, or are they tubes which are removed after a certain period? Those who follow this procedure would need to know the strength of their radio-activity and the hours of exposure as well as something of the method by which the necessary millicurie dosage for any case is arrived at. No one will disagree with Dr. Burrows's statement that radium gives almost perfect results in the treatment of rodent ulcers, where there is no involvement of bone and cartilage; when this condition is present, he has found that the excision of the edges of the ulcer by diathermy followed by deep electro-coagulation was good procedure. The report discusses the important question of the treatment of carcinoma of the body of the uterus, for which condition operation is still considered best. For uterine hæmorrhage, other than that caused by carcinoma, Dr. Burrows aims at reducing but not completely suppressing menstruation. He reports several cases amongst his patients at the Institute of normal childbirth subsequent to radium treatment for menorrhagia. A young woman after five years of childless married life and a longer period of menorrhagia was treated with radium, regained normal menstruation, and over a year later gave birth to a healthy child. Whether the Manchester Institute is employing the methods now so strongly urged in Paris, Brussels, and elsewhere of treating carcinoma by small amounts of radium for very prolonged periods is not stated. Many practitioners now possess small amounts of the precious element, and it is to institutions such as this that they naturally look to for help and practical instruction in its use. In future reports they would welcome fuller details of dosage and screening technique.

VACCINES IN THE TREATMENT OF TYPHOID AND PARATYPHOID FEVER.

THANKS in part to its good water-supply and close supervision of its milk trade, Copenhagen is remarkably free from enteric fevers, and in 1922 only 19 cases of typhoid and paratyphoid fever were notified. This state of affairs is an eloquent tribute to preventive hygiene, and doubtless prevention alone will some day stamp out these diseases. In the meantime, we have to consider the best measures for treating these ailments as well as preventing them, and in this connexion a most encouraging paper has recently been published by Prof. Valdemar Bie,[1] of the Blegdams Hospital, in Denmark. He has given a typhoid vaccine to 13 cases of typhoid fever and six of paratyphoid B fever. The vaccine was made from an agar culture of typhoid bacilli, and was in most cases given by intramuscular injection, the doses on five successive days being 100, 200, 400, 700, and 1000 million typhoid bacilli. The diagnosis in the cases thus treated was confirmed by a positive Widal reaction or by the culture of typhoid or paratyphoid bacilli from the blood or fæces. The numerous charts showing the action of the vaccine on the temperature bring out one interesting point: whether the fifth and last injection was given as early as the thirteenth or as late as the fortieth day of the disease, it was almost invariably followed in a day or two by a fairly rapid fall of the temperature by lysis to normal. Only in one case did the temperature fall by crisis on the day following the last injection, and such a fall was not considered desirable on account of the risk of serious collapse, such as was often seen during the war in Germany and Austria as a sequel to intravenous injections of typhoid vaccine in cases of typhoid fever. The conversion in most of Prof. Bie's cases of a high, continuous temperature to one that fell by rapid lysis was associated with other signs of improvement, such as a return of the appetite and the cessation of diarrhœa. There was only one death in this series of cases, and in this case the patient was very weak and already suffering from pneumonia when the first injection was given on the twenty-second day of the disease. In another case the patient's recovery did not seem to depend on the vaccine, no response to which could be observed. The action of the vaccine being effective in both the typhoid and paratyphoid groups, it could not be regarded as specific, and Prof. Bie suspects that these cases were illustrations of the efficiency of non-specific protein therapy. Recently he has been treating cases of typhoid and paratyphoid fever with intramuscular injections of a staphylococcal vaccine, and the results were as good as with his typhoid vaccine. The success of prophylactic vaccination against typhoid and paratyphoid fever depending essentially on the specific properties of the vaccine,

[1] Acta Medica Scandinavica, 1924, lx., 95.

it is curious to find the specificity of a vaccine playing such an unimportant part when it comes to treating an already established infectious disease.

HÆMATOPORPHYRIN AS A SENSITISER.

THAT media of various kinds can be greatly sensitised by the addition of very small amounts of certain pigments has long been known to photographers—e.g., sensitising a photographic emulsion film by the addition of minute traces of eosin. Amongst hæmoglobin derivatives, the researches of Hausmann, Meyer-Betz, and others have increased our knowledge of the photo-dynamic action of hæmatoporphyrin, which acts as a remarkable sensitiser. A small quantity of this substance injected into white guinea-pigs renders them so sensitive that they die from exposure to light. Meyer-Betz injected into himself very small quantities of hæmatoporphyrin and after exposing himself to very moderate light made himself very ill. This sensitisation to light opens up an entirely new field in therapeutics. As a further development in this direction is the work of E. C. van Leersum on the influence of hæmatoporphyrin on the deposition of lime salts in the bodies of rachitic rats.[1] Rats were rendered rachitic experimentally by feeding them on a diet composed of gluten, maize, gelatin, common salt, and calcium carbonate after the manner adopted by McCollum. The animals presented all the well-known phenomena of experimental rickets—swelling and diminished consistence of the osteoid tissue of the long bones, the rosary in the ribs, and the characteristic changes between the epiphysis and shafts of the long bones, together with the imperfect deposition of lime salts in the osseous tissue. These rachitic rats were treated at intervals by injecting subcutaneously 3–10 mg. of hæmatoporphyrin in an alkaline solution. The results on these animals were compared with numerous controls, both by X ray examination during life and microscopic examination after death, as well as by a study of amputated hind legs before the hæmatoporphyrin injection was begun. Various tests were made to determine the influence of hæmatoporphyrin on the deposition of lime salts. The favourable action of the pigment both on albino and parti-coloured rats suffering from experimental rickets was confirmed. It is suggested that this substance produces a special sensibility for those light rays where photo-dynamic action in comparison with the ultra-violet rays is small and which are ineffective against rickets, that there is a sensitising action of hæmatoporphyrin during the whole experiment while the animals are confined in a badly lighted room.

TOXIC EFFECTS OF LOCAL ANÆSTHETICS.

FOLLOWING on the discussion which recently took place in the Section of Therapeutics of the Royal Society of Medicine on the dangers arising from the simultaneous use of adrenalin and novocaine, a report of an investigation instituted by the American Medical Association into the occurrence of accidents from the use of local anæsthetics, which has just been published [2] is of some interest. A committee, on which all branches of medicine and surgery were represented, collected from replies to a questionnaire sent to members of the American Medical Association no less than 43 cases of deaths following local anæsthetics, all of which occurred in the course of three years. The findings and recommendations of the report are based on a careful analysis of these cases, and they bring out several points of importance. The majority of the deaths (26) were due to cocaine; butyn and apothesin were each responsible in four cases, and alypin, novocaine, and stovaine each in one or two. The symptoms produced were in all cases very similar, consisting in dyspnœa and arrest of respiration within a few minutes of the administration of the anæsthetic. The only useful method of treatment, in the opinion of the committee, is artificial respiration, perhaps accompanied by massage of the heart, while the use of morphine or adrenalin is definitely contra-indicated. The cause of the accidents was in almost all cases the use of unnecessarily large amounts of the anæsthetic, so that while the committee are aware of the possibility of individual idiosyncrasy playing a part in such cases, and of the existence of evidence suggesting that the simultaneous use of adrenalin heightens the toxicity of local anæsthetics, they are convinced that greater care in the matter of dosage and in the observance of certain rules will largely eradicate accidents. Thus it was striking that very few serious accidents have occurred in large hospitals. They recommend (1) that cocaine should not be injected into the submucous tissue or subcutaneously; (2) that cocaine paste should never be used; (3) that local anæsthetics should not be injected into the urethra where trauma or stricture exists; (4) that the following concentrations be regarded as safe: cocaine, in the mouth and epipharynx, 5 per cent.; in the nose, not over 10 per cent., and in total amounts of from 10 to 15 minims containing 1 to 1·5 gr.; in the eye, not over 5 per cent.; in the larynx and bronchi, not over 20 per cent. (preferably 10 per cent. in two applications), and not over 15 minims total. Novocaine should not be used in greater concentration than 1 per cent.; apothesin, not greater than 2 per cent. Butyn should not be used for injection. With reference to the use of adrenalin, in conjunction with cocaine, not more than 10 minims of 1 : 10,000 are permissible, and in conjunction with novocaine not more than 15 minims of 1 : 1000. The committee state that the result of their investigation has convinced them that accidents from the incautious use of local anæsthetics are common in medical and dental practice in America. Their report, written as it is with judgment and care, should be of assistance in lessening such occurrences.

MALARIA AND RHEUMATISM.

Dr. L. Lichtenstein,[1] of Bad Pistyan, remarks that it is of historical interest that at a time when malaria was supposed to be due to miasms acute articular rheumatism was also attributed to the same cause. Some writers, such as Haygarth, regarded acute articular rheumatism as a masked form of intermittent fever. This view was based on the tendency of both diseases to arise in low-lying damp localities and in certain climates to last for a very long time, and to be cured by certain specifics. Shooting pains in the muscles, dull pains in the knees, tenderness of the tibiæ, and aching in the sacral and lumbar vertebræ have long been known to be frequent accompaniments of an acute attack of malaria, but only a few cases have hitherto been recorded of malaria being complicated by polyarthritis. According to Fayrer, articular rheumatism is a frequent complication of malaria in Indian natives, but is not, like ordinary rheumatism, followed by endocarditis. Dr. Lichtenstein's experience is based on 21 cases of malaria complicated by polyarthritis. He divides the cases into two groups, the first comprising three cases in which polyarthritis developed in the acute stage of malaria, and the second group consisting of 18 cases in which it occurred in convalescence. In the first group the polyarthritis appeared on the fourteenth day and was not affected either by quinine or salicylates. In the second group, which consisted of 10 cases of benign tertian, 3 of quartan, and 5 of malignant tertian, the signs of acute articular rheumatism developed from two to six weeks after the last attack of malaria. In six cases the polyarthritis was afebrile and in 12 accompanied by fever, which was sometimes high or characterised by irregular remissions or intermissions. In almost all cases the knee-joints were affected either alone or in association with the shoulder- and ankle-joints. The fingers and toes were never

[1] Nederland. Tijdschr. v. Geneesk., vol lxvii., No. 19, 1923.
[2] Jour. Amer. Med. Assoc., 1924, lxxxii., 876.

[1] Weiner klinische Wochenschrift, 1924, xxxvii., 315, 316.

involved. The blood showed no malarial parasites during the presence of polyarthritis. Quinine and salicyl preparations which were usually combined caused some improvement, but had no remarkable effect. The course of the disease was usually protracted, and more or less severe changes persisted in the joints until they were relieved by thermal treatment. Dr. Lichtenstein is of opinion that the polyarthritis is of malarial origin owing to the date of its occurrence, and also because no organ in the body is unaffected by malarial toxins. The fact that the complication does not yield to quinine or salicyl preparations is no objection to this view, as there are plenty of cases of malaria that do not react to quinine and of acute articular rheumatism that are not affected by salicylates. There is, therefore, no justification for denying the existence of a malarial rheumatism.

THE INCUBATION PERIOD OF GENERAL PARALYSIS.

THE factors determining the outbreak of general paralysis are still so imperfectly known that a statistical investigation of this subject by Dr. Fritz Wiesel [1] is opportune. It has been suggested that the outbreak of this disease may be influenced by the behaviour of the original syphilitic infection—e.g., by its response to specific treatment, and that such factors as heredity—i.e., a family history of insanity and diseases of the central nervous system—degenerative stigmata, alcoholism, injuries to the head, influenza, over-exertion, and psychic strain may play an important part in hastening, or even determining, an outbreak of general paralysis. Another teaching, associated with the name of Dr. R. Stern, is to the effect that persons with a fragile build are predisposed to tabes, while fat, muscular, and robust persons are predisposed to general paralysis. Dr. Wiesel's researches provide little support for these ingenious correlations. His material consisted of 188 cases of general paralysis observed in various Swedish hospitals in the period 1907–20. In all these cases information was obtained as to the date when syphilis was contracted. In two cases the incubation period of the general paralysis was as short as two years; the longest incubation period was 39 years. Most of the cases developed from 10 to 20 years after infection, but there were as many as 51 cases, or 27 per cent. of the total, in which the incubation period was longer than 20 years. In 36 cases, or 19 per cent. of the total, it was under 10 years. The average length of the latent period was 16·6 years. As for the many different factors which are supposed to determine the outbreak of general paralysis, Dr. Wiesel could find none, with the possible exception of bodily over-exertion, psychic injuries, and influenza, which bore more than an incidental relation to the development of the disease. A record of relapses of syphilis of the skin and mucous membranes could not be correlated with any peculiarities in the subsequent general paralysis or its incubation period, and the age of the patient when syphilis was contracted, the patient's sex, and the vigour with which mercurial treatment had been pushed, were also factors the bearing of which on the development of the paralysis was obscure. But it seemed that when the incubation period was short the paralysis often proved fatal in a comparatively short time. In nine cases, in which the incubation period was only two to five years, the average duration of the paralysis, from its outbreak to death, was between 12 and 13 months. Though most of the findings in this paper are in a sense negative, it has served a useful purpose in clearing the ground for a careful and systematic study of a disease whose many natural riddles have been unnecessarily complicated by physicians with a flair for speculation rather than with a capacity for painstaking observation.

[1] Hygiea, 1924, lxxxvi., 145.

THE INNERVATION OF DENTINE.

THAT the dentine of the teeth is sensitive is a clinical fact familiar to all who have sat in the dentist's chair. The actual cause of this sensitiveness has been the subject of much speculation and investigation, until the discoveries of Howard Mummery in 1912 and succeeding years showed that the nerves of the dental pulp terminated in arborisations round a layer of nerve cells close to the margin of the pulp. The axons of these cells pass into the tubules of the dentine and have been traced as far as the junction of the dentine and enamel. Recently Mr. Mummery has shown that the nerves of the pulp in their course give off vaso-motor fibres to the arteries. In a paper read before the Odontological Section of the Royal Society of Medicine on April 28th he discussed the present state of our knowledge on this subject, and in order to make conviction more complete showed the original sections under the microscope. Sections of such delicacy as these are easily damaged, but there is no doubt that to those used to microscopical work the examination of the sections themselves carries with it a satisfaction and conviction lacking in drawings or micro-photographs. Though the majority of competent histologists have long since accepted the accuracy of Mr. Mummery's work, an occasional note of scepticism has been heard. We imagine that doubt can be no longer possible to those who were present at the reading of the paper and had the opportunity of examining for themselves the original preparations, and, with finger on fine adjustment, of tracing the course of the delicate neuro-fibrils from the pulp into the dentinal tubes.

UNUSUAL ACCIDENTS WITH ANÆSTHETICS.

TWO accidents, both unusual but neither of them unprecedented, have recently been reported in connexion with two of the safest anæsthetics—nitrous oxide and ether. They point the moral that in handling narcotic drugs—even those least easily associated with danger—care must be detailed and unremittent. The accident with ether resulted in severe burns to two individuals in the operating theatre. According to the press account the anæsthetic had been successfully administered *when a spark* from some electrical apparatus exploded a bottle of ether with great force. The ether burst into flames and the theatre was set on fire. This account is probably faulty in detail, for it is not easy to conceive of a closed bottle of ether being exploded by an electric spark. If the bottle were spilt, then, of course, the mixture of ether vapour and air which would be present might easily be ignited by an electric spark and might burst into flame with a detonation. One case has already been recorded in which vapour of ether and oxygen was thus "exploded" by the small electric globe of a laryngoscope. And on several occasions ether has burst into flame when a mixture of its vapour and air has been allowed to meet an open fire or a gas jet. In the case we are referring to, it is conceivable that the bottle of ether was in some place where it became hot enough for the ether to boil and burst the bounds of the bottle. Then it could have been ignited by the electric spark. Ether boils at a temperature of 96° F., and it is easily conceivable that this temperature might have been found in the immediate neighbourhood of a steriliser or heating apparatus. The other accident was unhappily fatal. It befell a student who was in the habit of trying the effect of nitrous oxide on himself. No solitary experiment should ever be made with a narcotic, even so apparently safe a one as nitrous oxide. For if unconsciousness supervene mechanical circumstances may render recovery impossible in the absence of immediate aid. This is probably the explanation of the rare deaths through nitrous oxide taken in solitude. When unconsciousness came through inhaling the gas the unfortunate experimenter, instead of letting go the apparatus and falling away from it, when recovery would rapidly ensue in all probability, most likely

fell in such a position that his mouth and nose were pressed into the face-piece, resulting in fatal asphyxia. A similar accident was reported not long ago, when the position in which the body was found in relation to the apparatus pointed unmistakably to this explanation.

THE DRINKING OF WATERS.

MEDICAL hydrology first began to receive serious consideration for the treatment of disease in this country more than two centuries ago; it is now slowly gaining a place in scientific medicine and becoming a recognised part of therapeutics. As regards both the internal and external application of natural mineral waters the indications for treatment have become more precise and their method of application more exact. No doubt the indiscriminate use of hydro-therapeutic measures, in which the choice of spa was often decided less by the suitability of its waters to any particular case than by the personal tastes of the patient, has delayed hydrology from taking its proper place in the esteem of the medical profession. The amenities of spa life, both social and climatic, are many—some of them are set forth in the notes on French Spas which appear on p. 1037—and exercise a beneficent influence irrespective of the water cure, but in our time it is only when combined with scientific application of the waters that they can command the whole-hearted approval of the medical world. The drinking of water, apart from the consideration of its specific mineral content, requires in many disease conditions to be carefully regulated to the needs of each particular case, and in our columns this week Dr. P. L. Violle, of the Institute of Hydrology in Paris, gives an account of the physiological tests he employs to determine the fate of liquids ingested by patients suffering from cardiac, renal, and cardio-renal affections. Such knowledge, as he points out, is indispensable in establishing the conditions under which absorption, diffusion, and elimination may be most efficiently accomplished, and in consequence how the dosage and nature of the liquids may be regulated. From the results of his fractional diuresis tests Dr. Violle draws definite conclusions for the regulation of liquid intake in certain pathological states. It is work of this nature carried out in the laboratory which is needed to supplement the existing knowledge of the therapeutic properties of spa waters in order that the maximum benefit to the patient may be obtained. Hydrology is but little studied in this country, although some consistent efforts are being made to supply the deficiency. In our news columns this week will be found a brief account of the second course of study under the auspices of London University, this time with practical demonstrations at Bath. During the coming week-end the new natural mineral water baths will be opened at Buxton. There is admirable equipment at our home spas for the study of hydrology, as it has been studied at many places on the continent, and Dr. Violle's paper shows one direction in which good work can be done.

THE summer session of the General Medical Council will commence at 2 P.M. on Tuesday, May 27th, when the President, Sir Donald MacAlister, will take the chair and give an address. The Council will continue to sit from day to day until the termination of their business.

THE Royal College of Physicians of London decided last week to discontinue the language test at the examination for the Membership. This test consisted in rendering into English two passages, one in Latin or Greek, the other in French or German. While the test acted as a deterrent to some otherwise suitable candidates, it could hardly be seriously regarded as evidence of scholarship, and therefore it has been discontinued rightly. Credit will still be given to those who desire to show real knowledge of languages, ancient or modern.

Modern Technique in Treatment.

A Series of Special Articles, contributed by invitation, on the Treatment of Medical and Surgical Conditions.

LXXI.

THE TREATMENT OF RENAL TUBERCULOSIS.

IT may be stated that in approximately 95 per cent. of all cases in which pus and tubercle bacilli are found in the urine the infection is renal in origin. The remaining 5 per cent. are accounted for by an ascending infection of the prostate and bladder in genital tuberculosis, by a process of elimination in miliary infections, and very rarely by primary tuberculosis of the bladder.

Before a definite line of treatment can be initiated a most careful investigation of the urinary tract must be made in order to fix the site and estimate the degree of infection present. The points to be elicited are as follows:—

(*a*) Abdominal examination may reveal an enlargement of one or other kidney with local tenderness; such symptoms may be due to disease, but it must always be remembered that the healthy kidney may have enlarged owing to more work having been thrown on it.

(*b*) Rectal examination often gives information of the extent of the disease, the points to be specially investigated being thickening of the ureters, and, in the male, involvement of the prostate.

(*c*) In the male careful examination of the external genitals should be made to disclose the presence of a primary or secondary epididymitis.

(*d*) Cystoscopic examination is essential in order to determine the presence of a badder infection, the location of the renal infection, and if one kidney alone appears to be infected the integrity and functions of the other kidney must be determined by ureteral catheterisation.

(*e*) A careful general examination of the patient must be made for the presence of active tuberculosis elsewhere than in the urinary tract.

Classification of Cases.

From the point of view of treatment cases may be classified as follows:—1. Unilateral renal infection, the other kidney being healthy, and with no infection of the lower urinary tract. 2. Unilateral infection with (*a*) secondary cystitis; (*b*) in the male, secondary infection of the epididymis on the same side; (*c*) associated nephritis or other non-tuberculous infection of the other kidney; and (*d*) associated active tuberculosis in some other part of the body. 3. Bilateral renal infection with or without secondary infection of the lower urinary tract or associated infection in other parts of the body.

Uncomplicated Unilateral Infection.—In Class 1, provided that the uninfected kidney is healthy and its excretory power is satisfactory, removal of the tuberculous kidney by lumbar nephrectomy should be performed, together with as much of the ureter as is possible through the same incision, if this shows evidence of infection at the time of operation.

Unilateral Nephritis with Complications.—In Class 2 (*a*) where there is a marked degree of bladder infection and irritability adequate examination often cannot be made until the bladder condition has improved. For this purpose complete rest in bed, together with tuberculin in small doses on the lines described below in the treatment of bilateral infections, should be tried. After six to eight weeks cystoscopy and ureteral catheterisation can usually be carried out under general or spinal anæsthesia, and, on proof having been obtained that the infection is unilateral, treatment is carried out as in the first class with, in addition, removal of the whole length of the ureter, if this is heavily infected, a separate incision being made for the lower part if necessary.

(*b*) When a unilateral infection is complicated by tuberculosis of the epididymis on the same side by

spread of the infection from the ureter to the vas, the initial treatment is identical with that indicated above—i.e., removal of the tuberculous kidney and ureter. If the operation is followed by adequate after-treatment by tuberculin, &c., as given below, in the majority of cases the lesion in the epididymis will heal. Castration should be reserved for cases in which extensive destruction of the testis and epididymis has occurred from caseation.

(*c*) In a certain number of cases of unilateral renal tuberculosis the urine from the uninfected kidney is found to contain albumin and possibly casts—i.e., a condition of nephritis is present. A careful investigation of the renal functions as a whole by blood-urea examination, and of the uninfected kidney by colorimetric and other tests should be carried out before operation is undertaken. Each case has to be judged on its merits, and no hard-and-fast rule can be laid down as to operability if this complication is present. In cases of doubt sanatorium treatment, together with tuberculin, will often improve the patient sufficiently to allow a nephrectomy to be performed. In a number of cases nephrectomy is followed by a complete disappearance of the signs of nephritis which were toxic in origin.

(*d*) Associated tuberculosis in some other part of the body is no bar to operation in unilateral infections, provided such lesion is quiescent or healed. Active pulmonary tuberculosis must be considered as a contra-indication to operation, and the risks of lighting up the infection as a result of anæsthesia must always be remembered in quiescent lung lesions.

After-treatment of Cases Treated by Operation.

A fortnight after operation, while the patient is still in bed, a course of tuberculin injections should be commenced. The initial dose of tuberculin (B.E.) depends to a certain extent on the severity of the infection, on the general condition of the patient, and on the presence of associated tuberculous lesions. As a rule in an uncomplicated case the first dose may safely be 1/20,000 mg.; if no reaction results, the dose is increased each week until a maximum dose of 1/100 mg. is reached in about 12 weeks. In cases complicated by other tuberculous lesions the doses are necessarily smaller, and in any type of case the dose should be regulated so as to produce the minimal amount of reaction. The doses should be given at the same time of day, and a four-hourly chart should be kept for 36 hours after each injection to check the reaction.

As a rule, in an uncomplicated case, the injections should be continued for six months, longer periods being necessary in more severe conditions; during the later stages of treatment the fact that injections are being given is no bar to the patient resuming his ordinary occupation. Regular examinations of catheter specimens of urine should be made during convalescence, and treatment by tuberculin should be continued for at least two months after tubercle bacilli and pus have disappeared from the urine.

Apart from treatment by tuberculin, the general after-treatment of these cases is similar to that indicated for any other case of surgical tuberculosis, with the exception that it is generally advisable for the patient to live in a rather milder climate than that usually recommended. In this country the south and south-west are preferable to the east and south-east coasts, and extremes of temperature are always to be avoided. The duration of convalescent treatment depends on the severity of the initial infection, but it is advisable to regard three months as a minimum, after which, in an uncomplicated case, the patient may resume his ordinary avocation.

As a rule, steady improvement follows treatment on these lines, the patient loses all symptoms, gains in weight, and the bladder symptoms rapidly disappear. Occasionally persistent bladder irritability continues, when the methods indicated later under the treatment of bilateral infections should be tried; it is necessary to emphasise that on no account should the bladder be irrigated, as this does no good, and may do much harm owing to the risk of a secondary pyogenic infection.

Prognosis.—The operation mortality in nephrectomy for tuberculosis of the kidney is with modern conditions very low, being under 1 per cent. The end-results, as shown by statistics published in this country and abroad, and from personal experience, are extremely satisfactory; in uncomplicated cases a permanent cure can be expected in 85 per cent. of cases after operation.

Treatment of Bilateral Infections.

In Class 3, where the infection is definitely bilateral, operative treatment in nearly every instance is impracticable, apart from such relief as may be obtained by the aspiration of a large tuberculous pyonephrosis or similar palliative treatment. The removal of the most seriously affected kidney has been advocated in the hopes of prolonging the patient's life, but is rarely, if ever, justifiable. The only hope of improvement lies in general treatment, together with a prolonged course of tuberculin injections.

General treatment is best carried out on sanatorium lines, the patient remaining at complete rest for the first three months at least. Diet need not be modified with the exception of some limitation of nitrogenous intake in severe cases. Extra fatty foods are essential and cod-liver oil with malt in large doses is always useful. The chief symptom which requires treatment is the frequent painful micturition which is so commonly marked in these cases. Local treatment of the bladder by irrigation or instillation is to be avoided, as it does little or no good, and may be the cause of a secondary pyogenic infection. Hexamine and its derivatives are of little value and often increase the bladder discomfort. On the whole, the following prescriptions, which may be alternated from time to time, seem to give most relief:—

(*a*)

℞ Tinct. hyoscyami .. ℥xx.
Liq. opii sedativi .. .. ℥ii.
Potassii citratis .. .. gr. xx.
Aquam chloroformi .. ad ℥i.

One ounce to be taken three times a day after meals.

(*b*)

℞ Ol. santali, ℥xx., in gelatin capsules.

One capsule to be taken three times a day after meals.

(*c*)

℞ Methylene-blue, gr. ii., in cachet.

One cachet to be taken three times a day after meals.

(*d*) The introduction of a suppository containing morphine hydrochloride, gr. ¼, and ext. belladonnæ alcoholic, gr. ½, into the rectum at night will often give relief from the nocturnal frequency which is so distressing.

Tuberculin Treatment.—After three weeks' complete rest in bed injections of tuberculin (B.E.) should be started. The initial dose depends on the severity of the infection and the presence of associated tuberculous lesions; it should always be very small, and as a rule 1/500,000 mg. is suitable. Doses should be given at four-day intervals at first in very gradually increasing strengths until 1/50,000 mg. is reached, then at weekly intervals until 1/100 mg. as a maximum is being given. As a rule, the time taken to raise the dose to the maximum is six months, and if this plan is carried out no reaction should be caused; any definite reaction is an indication for an immediate reduction of the dose. Treatment by tuberculin, if definite improvement is obtained, should be continued for at least a year, and in many cases may be continued for a much longer period.

Prognosis.—Bilateral renal tuberculosis is rightly considered to be a very fatal disease, especially when occurring in children and young adults, but from experience gained during the last five years it has been found that with prolonged and careful sanatorium and tuberculin treatment in a certain number of cases there is a chance of prolonging life, and in a few cases complete cessation of symptoms and disappearance of tubercle bacilli and pus from the urine have resulted.

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Special Articles.

CERTAIN OBSERVATIONS ON MALARIA MADE DURING TREATMENT OF GENERAL PARALYSIS.

Abstracted from a Communication made on May 15th to the Royal Society of Tropical Medicine and Hygiene, which will appear in full in the Transactions of the Society, Vol. XVIII., Nos. 1 and 2.

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Infections Produced by Inoculation.

Quartan Malaria.—On July 21st, 1922, two cases of general paralysis were inoculated from a case of quartan malaria contracted in West Africa. Both cases became infected, parasites being found in the peripheral blood within three weeks, and from these cases two others were successfully inoculated. All four cases were treated after the fever had lasted from three to five weeks with quinine in solution, gr. 30 orally, daily for two months; parasites disappeared from their blood in from four to seven days, the fever speedily subsided and no relapse, either febrile or parasitic, occurred.

On Nov. 25th, 1923, two other cases of general paralysis were inoculated with quartan parasites from an old-standing, naturally infected patient. No sign of infection was apparent up to Jan. 3rd, 1924, and it was assumed that the inoculations had failed, and one of the two patients was reinfected by the bites of *Anopheles maculipennis* infected with *Plasmodium vivax*. This case is of interest in connexion with the unicity theory of the malaria parasites, and will be referred to later.

Malignant Tertian Malaria.—One case inoculated with the blood from a patient suffering from malignant tertian malaria developed an infection of a fulminating character and the disease terminated fatally.

Simple Tertian Malaria.—As it was considered more desirable to work with simple tertian malaria, no attempt was made to carry on the strain of quartan or malignant tertian parasites. On Sept. 8th, 1922, a case of general paralysis was inoculated with simple tertian malaria. From this patient a long chain of cases of general paralysis has been infected with the result that during the last 20 months the strain has been transmitted by direct subcutaneous inoculation through 23 passages comprising 70 cases; of these 70 cases, five failed to become infected at the first inoculation. In addition to the cases in this chain, 28 other cases were inoculated either from naturally infected malaria patients or from second inoculation passages, and of these four failed to become infected at the first inoculation. The incubation period showed considerable variations, but was for the most part between 8 and 15 days. In four of the 98 cases the malarial infection underwent spontaneous cure in from 5 to 14 days; no relapse occurred. Of 61 cases treated with quinine orally for two to four days, practically all with quinine in solution, gr. 30, on each of three consecutive days, only one relapsed during an observation period which varied from 4 to 18 months, except in a very few cases in which it was between 2 and 4 months. Of 13 cases treated with the usual three-day course of quinine, gr. 30, on each of three consecutive days, and subsequently with two or three injections of small doses of novarsenobillon, only one relapsed during an observation period varying from 5 to 12 months. One case treated by two small doses of novarsenobillon only has not relapsed during an observation period of eight months.

A number of observations were made in order to ascertain whether by the administration of small daily doses of quinine for a short period before, and after, the inoculation of virulent blood it was possible to obtain a modified infection which might prove of equal value to the ordinary severe infection in the treatment of general paralysis. In eight cases to whom an oral dose of 10 gr. of quinine was given for varying periods before and after inoculation the development of infection was prevented during an observation period varying from 5 weeks to 4 months.

Infections Produced by Mosquitoes.

In certain cases it was considered desirable to infect patients by the bite of mosquitoes instead of by direct inoculation of infective blood. The mosquitoes used were mainly *A. maculipennis* infected with *P. vivax* by feeding on patients. The intensity of infection observed in mosquitoes fed on the same patient at the same time was fairly constant, but the degree of infection varied considerably among different batches of mosquitoes. It seems probable that these differences in intensity of infection are due not to any variations in the mosquito, but rather to the state of the patient's blood at the time the insects fed. When blood films made at the time of feeding showed the presence of many large and apparently full-grown gametocytes, the resulting infection in the mosquitoes was intense and a large proportion was found to be infected. The feeding of a mosquito which on dissection immediately after the meal was found to contain sporozoites in its salivary glands, in our experience, never failed to result in infection of the patient. However, the mosquitoes were always used for producing infection within a period of from 12 to 30 days after the infecting feed. We did not attempt to investigate the question how long they remained infective or how many persons it was possible by successive feeds to infect from one mosquito, but it was observed on the few occasions where an infective mosquito was fed successively (within the periods mentioned) on three or four patients infection always resulted. Of 41 cases, 39 were treated with the usual short course of quinine—i.e., gr. 30 in solution on each of three consecutive days. Six died shortly after treatment without parasites in the blood, and two about a month after treatment without having relapsed. Of the 31 cases who survived, four (13 per cent.) have relapsed within an observation period varying from two to six months. The other two cases were treated with several small doses of novarsenobillon and both of them relapsed.

Reference has already been made to the prophylactic action of quinine in inoculated malaria. It was decided to repeat these observations with the mosquito-borne strain, not only for the reasons given previously, but also because anopheles capable of spreading malaria are known to exist in the grounds of many of the mental hospitals in this country, and it seemed desirable to ascertain whether, if necessary, the inmates of the mental hospitals and the general public in the neighbourhood could be protected against accidental infection by quinine administered as a prophylactic.

It was found that when even small daily doses (5 gr.) were continued for two to six weeks after inoculation protection was given, but even large doses given before inoculation failed to protect unless they were continued for a considerable time after inoculation.

Unicity Hypothesis of Malaria Parasites.

Even up to the present time a number of authors adhere to the view that there is only a single species of malaria parasite found in man. The following observations made in the course of this work appear to render the unicity hypothesis untenable. 1. In six patients inoculated between July and November with *P. malariæ* only forms typical of this species appeared in the blood. 2. In one patient inoculated

in July with *P. falciparum* only forms typical of this species appeared in the blood. 3. In 98 patients inoculated at all periods of the year with *P. vivax* only forms typical of this species appeared in the blood. 4. In 41 patients infected between September, 1923, and April, 1924, by the bites of *A. maculipennis* or *A. bifurcatus* infected with *P. vivax*, only forms typical of this species appeared in the blood. This observation appears to us to be particularly important in view of the statement, frequently to be found in French literature, that primary infections are malignant tertian. 5. Finally, as already recorded, a case was inoculated with *P. malariæ* from a naturally infected patient on Nov. 25th, 1923, and as he had not shown parasites in his blood or exhibited any symptoms of malaria by Jan. 3rd, 1924, was subjected to the bites of mosquitoes infected with *P. vivax*. This patient showed *P. malariæ* for the first time in his blood on Jan. 8th, and *P. vivax* for the first time on Jan. 18th; both parasites persisted in the blood up to the time of treatment.

Effect of Numerous Direct Passages of P. vivax Through Man.

It is now well recognised that many trypanosomes pathogenic to man and stock undergo a marked increase in virulence to certain species of laboratory animals when maintained in them for long periods by direct inoculation from one host to another. In some cases—e.g., *Trypanosome brucei* vel *T. rhodesiense*, this alteration of virulence is attended by certain morphological changes. It is important, however, to note that such changes do not occur in the early passages, but apparently take place only after the strain has undergone a certain number of direct passages through the vertebrate host. It is therefore of considerable interest and importance to inquire whether the prolonged sojourn of *P. vivax* in the human host, comprising 23 direct passages from man to man without the intervention of the insect intermediary during a period of nearly two years, has had any influence on the parasites or on the type of infection which it produces.

Comparisons between the types of infection, temperature charts, and clinical signs in patients infected early and those infected after several passages indicate that the strain had undergone no increase in virulence during its direct passage from man to man through 23 generations, nor does the morphology of the parasite appear to undergo any change after many passages.

Susceptibility of Induced Malaria to Treatment.

The observations of previous writers, that general paralytics who had been infected with malaria by inoculation were easily cured by comparatively short courses of treatment with quinine and salvarsan or with quinine alone, have been confirmed by us. On contrasting the results of treatment of inoculated cases with those obtained in the treatment of simple tertian malaria during the war and in ordinary practice, one cannot fail to be impressed by the striking difference, especially in the percentage of relapses.

Various hypotheses have been advanced to explain the remarkable sensitiveness of the *inoculation-strain* to quinine treatment. It appears to us that the true explanation of the success of treatment in these induced infections is to be sought in the fact that we are here concerned with the early treatment of disease, or, in other words, with the treatment of primary infections, and not, as in the war or as frequently in practice, with old-standing relapse cases.

The Mechanism by which Cure is Obtained in Malaria.

In endeavouring to explain why a cure is sometimes effected and sometimes not, we commence with the assumption that no form of quinine therapy per se ever destroys all the malaria parasites in the human body. In the treatment of malaria, the train of events is, in our opinion, as follows. Quinine given to a patient whose blood contains numerous malaria parasites invariably destroys directly, or more probably indirectly, large numbers, but not all of the parasites, thus setting free a considerable quantity of soluble antigen. The antigen provokes by stimulation of the host's tissues the formation of immune-body. The immune-body, if present in sufficient amount, destroys the remaining parasites, thus resulting in sterilisation of the infection and the cure of the patient. For a cure to be obtained, this hypothesis demands, first, the setting free of a considerable quantity of soluble antigen by the destruction of a large number of parasites, and, secondly, a capacity on the part of the host to respond to the antigen by the formation of a sufficient quantity of immune-body. If for any reason either of these two requirements is not satisfied, the infection is not completely sterilised and a relapse occurs. With regard to the first of these two requirements, we have long been impressed with the fact that the administration of quinine when the blood contains numerous parasites is more efficacious than its administration when the blood is free from parasites. The second requirement for the production of a cure is that the cells or tissues of the host shall be able, in response to the antigen stimulus, to produce a sufficient quantity of immune-body. That the human host exhibits a certain degree of natural immunity to malarial infection and that this is capable of being increased in response to the proper stimulus there can be little doubt.

There is, in our opinion, a considerable mass of evidence indicating that man exhibits some degree of immunity to malaria and that this is capable of being increased in response to the proper stimulus. His natural immunity is but slight, and in the vast majority of cases insufficient to prevent the development of the infection; in patients who have recovered, either spontaneously or after medication, from an acute attack of the infection the immunity may be increased to such an extent that it may be impossible to reinfect for various periods, which are probably much shorter in the European than in the native; and finally, in cases where the symptoms have subsided spontaneously, without the complete disappearance of parasites from the blood, reinfection by the feeding of infective mosquitoes does not result in an exacerbation of fever. The immunity is, however, relatively slight, and there is evidence that the malaria parasites readily develop an immune-body resistance. It is important to note that immunity developed against one species of plasmodium does not confer a similar protection against the other species.

We consider that there exists considerable evidence in support of the hypothesis that the essential factor for the production of cures in malaria is the capacity of the host to produce immune-body in response to the antigen formation resulting from the destruction of a considerable number of parasites by a medicament. When for any reason the host is unable to produce immune-body in sufficient amount, sterilisation does not take place and a relapse occurs. We surmise that certain individuals are unable to produce a sufficiency of immune-body to sterilise the malaria infection owing to ill-health at the time of infection and treatment or possibly owing to a personal idiosyncrasy, and that these are the patients which develop eventually into chronic relapse cases. The immune-body produced in such cases is insufficient to destroy all the parasites which have escaped the action of the quinine; the parasites which persist gradually acquire an immune-body resistance, so that the relapse strain, although reacting to quinine as usual, is not completely destroyed by immune-body.

Quinine Prophylaxis.

Observations on the value of quinine prophylaxis showed that administration of the drug before infection is useless, that its administration must be continued for at least 10 days after the infecting feed to prevent infection from developing, and that the daily dose given has but little influence apart from the fact that with very large doses (30 gr.) the period for which the drug has to be given to prevent develop-

ment of infection is a little shortened. It is concluded from these observations that quinine has little, if any, action on sporozoites, and that the mechanism by which development of infection is prevented is similar to that by which a cure is effected.

Value of the Malaria Treatment of General Paralysis.

Up to the time of writing a sufficiert period has elapsed to enable a judgment to be formed regarding the effect of the malaria treatment in respect of 84 patients suffering from general paralysis. In presenting these results we have relied on the judgment of the medical officers in charge of the patients at the various mental hospitals. Of the 84 patients treated 14 have died, most of them immediately, or shortly, after the completion of the course of malaria treatment; although all these cases had been treated with quinine before death and parasites had disappeared from the blood, nevertheless it is impossible to affirm that in none of them was death accelerated by the malaria. No noticeable change in mental or physical condition has been observed in 20; with regard to these cases, however, it is to be borne in mind that in the ordinary course of events many of them would now be dead. In ten there is definite physical improvement, but no change in the mental condition. In 17 there is great physical and distinct mental improvement. Finally, in 23 the mental and physical improvement has been so great that the patients have been, or are about to be, discharged from the mental hospitals. In a number of the cases the improvement has been maintained for many months—in some for as long as a year—and quite a number are back at their old occupations. As time goes on, it may be found possible to discharge still others of these 84 cases for, as Wagner-Jauregg writes, "The maximum of the improvement does not manifest itself at once at the end of the period of fever but does later. On the contrary, the improvement continues often for a long period, so that in many cases the result seemed to be an incomplete one where later however a complete remission came to pass." Whether the improvement is temporary or permanent only time can decide, but the results already achieved can only be regarded as remarkable when it is realised that no patient suffering from general paralysis had previously been discharged from the mental hospitals in question.

THE WILLIAM DUNN LABORATORIES.

ON Friday in last week Lord Balfour, Chancellor of the University, opened at Cambridge the new William Dunn Laboratories for the study of biochemistry.

The magnificent donation to the University of £210,000 from the estate of the late Sir William Dunn reached the University by a series of fortunate accidents, for the residue of this city merchant's great fortune was left in the hands of trustees to be used for the "alleviation of human suffering," no more precise directions being given. The executors of the will were the directors of the Commercial Union Assurance Company, who appointed a small committee to assist them in the responsible task of allocation, and the accidents referred to were the various circumstances which led to the decision of this committee before whom so many and various opportunities of benefiting mankind were unrolled. The final recommendation of this body was that a well-equipped and thoroughly modern building for the study of biochemistry should be erected at Cambridge, and Lord Balfour, in accepting the great gift in the name of the University, indicated in a convincing way how the developments of biochemistry are being now employed, with a promise of still greater employment in the future for the arrest and prevention of disease.

The Buildings.

The new laboratories are situated on the east side of Tennis Court-road, on part of the old park of Downing College and in immediate proximity to the science schools. They form a handsome block of three stories, having at the top a large general laboratory, and below a quantity of smaller rooms elaborately equipped for carrying out any procedure cognate to research in biochemistry. There is also a large library, which has been made the subject of a most generous donation of £2000 from Sir Jeremiah Colman, the chairman of the Dunn Trustees.

The opening of the laboratories formed but a brief ceremony. Sir Jeremiah Colman, with whom were his co-trustees, the Hon. A. H. Holland-Hibbert, Sir James Leigh-Wood, and Mr. C. Seligman, formally handed over the buildings to the Chancellor, congratulating his old University on having obtained the prize in a field where there had been keen competition, a result which he attributed to the high position which the medical school of the University had made for itself.

The Progress of Biochemistry.

Lord Balfour, in receiving the gift of the laboratories, said that the problems of disease could be approached and were being steadily solved in certain directions along lines of pure chemistry and pure physiology. But he showed that research along the double track of biochemistry held out a more than double promise, chemical research with a biological basis offering infinite possibilities for fruitful discovery. He congratulated the trustees of Sir William Dunn's estate upon the business acumen which had brought about appreciation of this fact, and upon the wisdom which had prompted them to endow research in order that efforts for the alleviation of human misery might be directed by theories having behind them broad and intensive experimental study. On the breadth of sound research he laid especial stress. Taking malignant disease as a typical example of a widespread source of human misery whose origin was as yet unexplained, he hazarded the conclusion that when the causes of cancer became known, so that effective measures of control or prevention could be taken, this splendid consummation would be the result of a discovery made with no special consideration of the phenomena of morbid growths, but one which opened up some generalisation which in its turn would shed a flood of light upon the accumulated knowledge of generations of medical observers. He concluded by expressing his confidence in the leadership of Prof. Gowland Hopkins, the devotion of his collaborators, and the promise held out by the great work of biochemistry now proceeding in the Cambridge school.

A Dinner to the Trustees.

In the evening a dinner was given in honour of the trustees at Trinity College, the Master, Sir J. J. Thomson, presiding. The Chancellor, the Vice-Chancellor, many heads of houses and professors, as well as a representative group of guests were present to meet the trustees.

PARIS.

(FROM OUR OWN CORRESPONDENT.)

Hospital Ventilation.

To maintain the air of a hospital ward as closely approximate as possible to the exterior air, provision must be made for continuous ventilation so that the air of the ward is renewed three times in the hour, and although it is easy to preserve an equable temperature during the winter, it is a more difficult matter in summer. Dr. Jules Renault recently demonstrated to the Academy of Medicine the apparatus which he used to maintain the constant ventilation of his wards in the Hospital San Louis (Grancher Annexe) by warm air in winter and cool air in summer, with an adequate percentage of moisture at all seasons. The installation is designed as follows: in the basement there is fixed an intake pipe and two pieces of

apparatus which regulate the temperature and humidity; in the ward there are distributing pipes for the fresh air, exit pipes for the foul air, a regulating switch-board, and a registering thermometer and hygrometer. The intake opening is situated about two metres above the ground in the courtyard and is furnished with a retaining-box for dust, containing a filter of about 40 cm. in thickness and composed of a series of sieves of woollen mesh placed at suitable distances one on top of the other. This removable filter retains all its properties for several months without causing any appreciable resistance to the passage of the air. It needs only to be cleaned twice a year. Further, an electric fan allows the intake of air to be conveniently regulated. The fresh air is driven through a large casing which divides into two smaller casings passing through the basement, and terminating in the regulator apparatus. This is composed of (1) a radiator to heat the air, formed of copper tubing through which steam at a very low pressure passes. (2) A radiator for the cooling of the air, larger in size and placed at the lower part of the apparatus and also formed of copper tubing, through which passes a current of cold water from the town main at a temperature of about 13° C. A two-way valve worked from the switch-board in the ward permits the air to be directed either through the heating apparatus or through the cooling apparatus. (3) A moistening trough in which the air passes above water which is made to evaporate by steam at low pressure in a coiled tube. The amount of water evaporated varies with the area of the coil brought into contact with the water, and a switch on the switch-board allows this area to be altered at will. The treated air is then conducted by water-tight and properly insulated casings to four distributing outlets fixed along the walls of the wards. These outlets are constructed in such a fashion that the air exits from holes in the sides along the walls and does not blow directly down on the patients. The beds are placed in the middle of the ward in cubicles arranged around a central pillar. The air is withdrawn from the room from the upper part of the windows by means of three vents furnished with balanced aluminium valves which rise on positive pressure in the interior air. The movement of these valves shows clearly that the air passes out freely and that the ward is adequately ventilated. At any hour of the day or night the composition of the internal air is similar to that of the exterior air. The temperature is maintained in winter between 20° and 21° C., and in summer between 21° and 23° C., even when a thermometer placed outside indicates 30° C. The hygrometer reading varies during the year between 40 and 50 per cent. From the physiological point of view the air is maintained sweet and fresh. Finally, from the pathological point of view colds, bronchitis, bronchopneumonias become rare sequelæ in the wards in winter, and heat-stroke in summer is obviated.

The Medical Coupons Scandal.

The tribunal on those involved in the medical coupons scandal, details of which were set forth in my letter published in THE LANCET of June 16th, 1923, has now pronounced judgment. It will be remembered that on Sept. 23rd, 1923, following a long inquiry, several doctors were found guilty of swindling, their accomplices being chemists, presidents of associations of old soldiers, and agents. They had created a vast organisation in order to turn to their own profit the law which authorises payment by the State for medical care and drugs given to those wounded in the war. The swindle had gone on for three years on a grand scale, and it is estimated that the cost to the taxpayers approached 20 million francs. Eight doctors and four chemists and ten other persons were found guilty, several of the sentences being very severe. For example, one doctor was given two years' imprisonment, 3000 francs fine, and ten years' of interdiction from the practice of medicine. He was also ordered to pay 33,123 francs to the State, 2500 francs damages to the Union Fédérale des Mutilés et Blessés de Guerre, jointly with three other culprits, and one franc (corresponding to one farthing damages), to the Syndicat des Médecins de Marseilles. This appears to be the most severe sentence given to any of the medical men, whereas pharmacists and non-professional persons were given sentences more or less heavy. The president of the Union Fraternelle des Éprouvés de la Guerre is to be imprisoned for three years. No one in any country will fail to rejoice that such flagrant abuse of professional privileges met its deserts.

Evolution of Hepatic Cirrhosis according to Sex.

In making an analysis of the observations of cirrhosis of the liver recorded at the clinic of the Hospital of St. Antonine during the years 1922–23, Prof. A. Chauffard and Dr. Brodin found that in man the evolution of the condition differed from that in woman. In the man there was found the classic picture, with liver atrophy and recurring ascites, necessitating repeated tapping which resulted eventually in death from cachexia. In the woman, on the other hand, the liver was generally hypertrophied and the disease developed by spurts, showing occasional improvements varied by short relapses. Finally, after a longer or shorter quiescent period new features might arise, frequently acute tuberculosis. The cause of death in women was not a slow cachexia but hepatic insufficiency. This difference in development seems to be due to lower powers of resistance in the female liver against infections and intoxications, particularly that of alcohol.

BERLIN.

(FROM OUR OWN CORRESPONDENT.)

Isolation of the Virus of Foot-and-Mouth Disease.

BEFORE the Microbiological Society of Berlin, as I have already informed you, Prof. Frosch, head of the bacteriological department of the Veterinary College, reported that he had succeeded in discovering the virus of foot-and-mouth disease, which hitherto could not be rendered visible by the ordinary optical methods. Together with Prof. Dahmer and Prof. Köhler, of the Zeiss works in Jena, he used ultra-violet rays to demonstrate the germ, which was th n cultivated on a solid nutrient medium. It p:oved to be a bacterium of very small size. The author gave a report of the technique of his method and of the successful inoculations made with the virus. The discovery, which is of great scientific and practical value, is now being examined in the Robert-Koch Institute in Berlin.

Abortion in Germany.

The incidence of abortion has become very frequent in Germany. In the *Aertzliches Vereinsblatt* a country medical man states that the practice of inducing abortion, which hitherto was a prerogative of the cities alone, has now become widely spread among the rural population. He states that nearly as often as he ascertains pregnancy in a woman he is called a few days later to her because she is aborting; the midwives complain that the number of births has recently very much decreased. There exists indeed a society which delivers lectures throughout the country under the pretext of giving contraceptive information, and it is an open secret that they give such permissible advice, while they also teach pregnant women how to bring about miscarriages. The author wishes to draw the attention of the authorities to that society which, notwithstanding its harmless name, has illegal aims. The views of the correspondent are strongly opposed by a Berlin medical man who is known to be an active member of the Communist party and who declares that the abortion epidemic is caused by economical reasons only, mothers being afraid of becoming unable to procure food for the child. According to this Communist doctor, it is quite unreasonable to prosecute for induced abortion. In Russia the penalties for illegal abortion were abolished immediately after the revolution, and it became legal to interrupt pregnancy for economical

reasons provided it was sanctioned by a State medical officer and performed in a State hospital within the first three months of pregnancy. Moreover, the Russian law provides that a pregnant woman shall be paid her full wages even if owing to her state she is able to do less work; she also receives her wages for two months after her delivery even if totally incapacitated for that time, and an extra benefit to enable her to buy things necessary for her child. Commenting on the present situation, the editor of the *Aertzliches Vereinsblatt* says that it seems unreasonable that the Russian law should permit induction of abortion for economical reasons when it supports women during their pregnancy and after the birth in such a lavish way as described by the correspondent. Germany ought to follow the example given by Russia in the care of pregnant women, but to decline to make criminal abortion lawful, even if performed by a State medical officer.

Insurance Practice in Britain and Germany Compared.

The many difficulties in insurance practice induced the Berlin Medical Chamber to inquire into the state of things in other countries. The Chamber therefore approached the British Medical Association for information and their request met with a friendly reception, as Dr. Cox, the secretary of the Association, sent to the Medical Chamber articles he had written on insurance practice in England in the *Journal of the American Medical Association*. These are printed in full in two issues of the official organ of the Berlin Medical Chamber under the title of "Seven Years of National Insurance in England." By special permission of the author and of the editors of the *Journal of the American Medical Association* it will also be published as a separate volume. The articles are of great interest, as they show that the principal feature of the English law from a medical point of view is that no medical man desiring to practise under the Insurance law is excluded from so doing, except for serious reasons. Also, the English law benefits a smaller part of the population than the German one, and that insurance work forms only a small part of the income of the average English doctor, whilst in Germany insurance practice is the principal and sometimes even the only source of income of most practitioners. The number of medical men doing work under the Insurance law, as quoted by Dr. Cox, is 12,850 of 24,000 medical practitioners residing in England, Scotland, and Wales, being about 55 per cent. This is a much smaller percentage than that of Germany, where only a few medical men are entirely independent of club practice. It is true that in the larger towns many medical men, particularly specialists, have consulting rooms for club patients outside their residence, or in their residence special hours for them, where they come not in touch with private patients. It certainly seems to be an advantage that club patients are in this way able to consult leading specialists under the club tariff; otherwise the middle classes under present financial conditions would be unable to get specialist advice. A great advantage of the English law is the determination and the payment of the fees by the Government, so that battles with the clubs and strikes are more easily avoided than in this country. The issue of the recent big medical strike in Germany is a warning example of the disadvantages caused by such incidents both to the medical profession and to the insured. It may be noticed that since my last letter the medical strike which had then ceased in the greater part of Germany has been called off in Berlin also. Both parties have come to an armistice until July 1st, the conditions being that the medical men will continue to attend club patients as private patients at moderate fees, but that those fees are no longer paid, as during the strike, by the patient himself but by the club to which the bills must be sent by the medical attendant. During the armistice both parties will enter into negotiations for a definite settlement of the system of medical attendance.

German Medical Men in Afghanistan.

The economic conditions of Germany have induced many medical men to emigrate into foreign countries where there seems to be some hope for them to earn a livelihood. As already mentioned in these columns, the Afghan Government some time ago had asked German medical men to settle in that country. Notwithstanding the warnings of medical men with experience of hot climates, a large party made the journey at their own risk from Germany through Russia to Afghanistan in the hottest time of the year, the result being that several members of the party died on the journey from malaria or dysentery, and a number of the survivors became seriously ill. In this connexion the *Leipziger Verband* warns medical men against undertaking private arrangements with foreign Governments without the assistance of the *Verband*, pointing out that the rush for such appointments is undignified and tends to lower the standing of the German medical profession. This is the more the case as the Afghan disaster is not the only one caused by the inexperience of German medical men, but that similar facts are reported from elsewhere.

Retirement of Prof. Gottstein.

Prof. Gottstein, the chief of the Prussian Medical Department, has retired from office, the law providing that all Government officers must do so on reaching the age of 65 years. Prof. Gottstein, who after the revolution had succeeded Prof. Kirchner, had a difficult task, as he took office at a time when Germany had just passed through the dangers of war and of revolution with the concomitant bad hygienic conditions. He did good work in arranging for the instruction of Government medical officers by instituting an academy for social hygiene, where he will continue to lecture after his retirement. His work in the care of tuberculous, venereal, and cancer patients respectively was made difficult by reason of the small sums the Treasury could spend for hygienic purposes. He will be succeeded by Dr. Dietrich, a senior member of the department.

The Services.

ROYAL NAVAL MEDICAL SERVICE.

Temp. Surg. Lieut. A. E. Phillips is transferred to the Permanent List.

J. A. Cusack and V. F. Walsh to be Surg. Lts.

The following appointments have been notified: Surg. Lt.-Comdr. (D.) W. E. C. Sampson, to the *Victory*, for R.N. Barracks, Portsmouth; Surg. Lt. (D.) H. J. Luck, to the *Warspite*.

ROYAL ARMY MEDICAL CORPS.

Capt. S. J. Barry to be Maj.

Capt. C. Russell retires receiving a gratuity and is granted the rank of Maj.

TERRITORIAL ARMY.

Maj. R. Phillips to be Lt.-Col. and to command the 47th (2nd Lond.) Casualty Clearing Station.

Capt. J. Kinnear to be Maj. (prov.).

Capts. A. L. Taylor (late R.A.M.C.), K. Simpson (late R.A.M.C.), and C. Shaw-Crisp (late R.A.M.C., Militia) to be Capts.

Capt. A. Rodd, R.A.M.C., to be Divl. Adjt. 43rd (Wessex) Divn., vice Capt. W. W. S. Sharpe, R.A.M.C., vacated.

Lts. C. H. A. Alderton and R. H. Hadfield to be Capts.

Sanitary Companies.—Lt. A. Massey (late R.F.A., T.A.) to be Capt. (prov.) with pay and allowances of Lt.

Supernumerary for Service with O.T.C.—Maj. C. E. Searle to be Lt.-Col.

ROYAL AIR FORCE.

G. P. O'Connell is granted a short service commission as a Flying Officer.

Flight Lt. (Hon. Squadron Leader) H. B. B. Greene relinquishes his temporary commission on ceasing to be employed and is permitted to retain the rank of Flight Lt.

INDIAN MEDICAL SERVICE.

The King has approved the grant of a temporary commission as Lt. to Capt. Shiva Shankar Gupta, late I.M.S., who relinquishes the rank of Capt.

BRITISH EMPIRE EXHIBITION, WEMBLEY:

HEALTH IN THE TROPICS.

"This Exhibition . . . stands for the coördination of our scientific knowledge and a common effort to overcome disease . . . in many parts of the Empire."—H.M. THE KING.

II.

THERE are many aspects of medical service in the East which require consideration apart from general therapeutics. Among others is the provision of proper obstetrical aid, and in this connexion the photographs in the exhibition of Indian home nursing, as it is, and as it should be, give food for thought, the wonder being that the puerperal morbidity-rate is not a great deal higher. Religious pilgrimages are a source of great danger from the point of view of disease dissemination, and the illustrations of the elaborate arrangements made at various places, especially at Suakim, are worth seeing. Looking at the exhibits from Burmah and Arakan one does not envy the registrar his task if he has to prepare his reports from the chipped and coloured pieces of bamboo and wood that form the medium of registration of births and deaths in these parts.

In the light of what we hope will be a reawakened interest in the medical affairs of our many dominions it may not be out of place to present in a short form some of the reports in our hands from medical officers in a few representative parts of the Empire.

The majority of these deal with the year 1922, a few of them with the year 1923 in part or whole; they may be roughly grouped into three sections: (1) New Zealand and New South Wales; (2) certain African territories, mainly to the east of the continent; (3) the great tea and rubber districts of the Malay Archipelago, with which may be placed a report on the North-West Frontier of India.

(1)

The report from *New Zealand* is an excellent one, the only adverse features being a declining birth-rate and an outbreak of typhoid fever, the latter due to water pollution in the lava catchment area of Mount Albert. The outbreak was rapidly taken in hand and with a new main water-supply to the area the disease was eradicated. Dr. Truby King is the moving spirit in the infant welfare work, and the State-subsidised home nursing staff is increasing in numbers. The figures of the school inspection staff are interesting; in all 34,400 children were examined and the following defects found:—

	Per cent.	
Dental defects	67·16	
Defects other than dental—		
Postural and structural trunk and chest	26·03	60·40
Cervical glands	11·25	
Enlarged tonsils	11·23	
Subnormal nutrition	7·41	
Goitre	6·20	
Defective vision	3·18	
Defective hearing	0·79	

The infantile mortality-rate is 41·9, the lowest to be found in any of the reports and the best ever realised in New Zealand. There are many Maori health councils doing good work and receiving widespread support from the Maoris themselves.

The report from *New South Wales* does not compare favourably. There was an outbreak of diphtheria with 6854 cases and 306 deaths, and also a reintroduction of plague after a lapse of 12 years, but only two human beings were infected, although large numbers of infected rats were killed. The State has no control over midwives, many unqualified women practise, and puerperal fever is not notifiable by private hospitals; a Bill to remedy this state of things has been before Parliament for about three and a half years, but has not yet become law. The Rockefeller Institute is coöperating with the State authorities in the Tweed River area against hookworm, treatment is offered gratis and lectures and advice are given; the defective sanitation is being dealt with vigorously. The Pure Food Act of 1908 is bearing most excellent fruit, only 3·2 per cent. of the milk samples were found adulterated during the year. Phthisis, diphtheria, and typhoid were the chief killing diseases in 1921, the death-rate from phthisis in New South Wales, however, is only half that of England. The infantile mortality in Newcastle (N.S.W.) is 247 per 1000, and in this area there is a grave house shortage, which, however, is being tackled as rapidly as possible.

(2)

Among the reports from Africa that from *Kenya* makes interesting reading. The European health is best in the southern highlands, where for a tropical region a fairly temperate climate prevails. In 1922 there were no epidemics and the general health was good; many hygienic and sanitary works are held up on account of financial stringency, but good headway is being made nevertheless. The native death-rate is approximately 19–23 per 1000, the European only 9·04.

Tanganyika presents a comprehensive report, of which we publish a substantial abstract on p. 1039. The territory is a large one, some 365,000 square miles in area, with a native population of about four millions. Particular attention is drawn to the sterility of the Swahili women, partly due to venereal disease and partly to in-breeding. The survival rate of the children is adversely affected by congenital syphilis and by the infanticidal practices of the native medicine-men, which are now to a certain extent being put down by the new ordinances. The one ominous factor in the report is the mention of an introduction of trypanosomiasis into this area, where the tsetse-fly abounds and has hitherto been free from infection, active measures are therefore being taken to prevent the fly becoming infected. The report is interesting as showing in a fairly representative district the difficulties of medical administration among the natives of Africa.

Swaziland has had a good year as regards health, with very little malaria and practically no enteric. Syphilis is very prevalent among the natives, and during the year there were outbreaks of both mild small-pox and mild influenza, the death-rates of both being very low, in the case of the former due no doubt to the extensive vaccination of the native population.

Somaliland is evidently very healthy for Europeans; among the natives the only widespread infection appears to be venereal disease.

(3)

This group covers a wide field, chiefly in Malay and India. Visitors to the Malay pavilion at Wembley will see a model and a very good collection of photographs of the quarantine station at St. John's Island, *Singapore*, the largest of its kind in the Empire, and they will see what efforts are made to localise epidemics likely to be spread by sea-borne traffic. The death-rate in Singapore in 1922 was slightly greater than the birth-rate, largely owing to the high infantile mortality-rate, much of it the result of tetanus. The European death-rate is low, being 9 per 1000.

In *Brunei* malaria and ankylostomiasis are very prevalent, as is also venereal infection, which owing to difficulties with the natives is not easy to treat in the early stages. Since small-pox decimated the area in 1905–06 there have been no serious epidemics of any kind.

The report from the *Federated Malay States* shows an increase in the female Chinese population, which is supposed to herald a more permanent settling by the Chinese, and is welcomed by the authorities. The native birth- and death-rates almost balanced for 1922, and the infantile mortality-rate was 170·8. Yaws and syphilis are being energetically treated with novarsenobenzol; as regards the former, the disease is almost eradicated. The passing of the Midwives Registration Act and the fact that the vaccination-rate exceeds the birth-rate are both

satisfactory points. As regards mental diseases the statistics are worthy of notice; although the incidence of malaria is enormous, only 78 cases of mental disease were attributed to it, 35 and 37 cases among the Chinese were attributed to syphilis and alcohol respectively and only two to opium.

In some of the *Unfederated Malay States* the natives are highly infected with ankylostomiasis and ascaris lumbricoides, but there have been no serious epidemics of other diseases. The Malay women are not tolerant of the trained midwife, and this together with bad sanitation gives a high infant mortality-rate, highest among the Indians (220), lowest among Europeans (37). Puerperal fever takes a heavy toll of the women. Health departments and school medical services are rapidly increasing. The cancer-rate among the natives is very low, as stated (0·25 per 1000), but as post-mortem examinations are not frequently held this figure is open to question, but even when allowances are made it is striking. Householders are very apathetic in helping with anti-mosquito work, which is much hindered thereby.

In *Ceylon*, an island splendidly equipped with all manner of medical requisites, the general health is very good, and here again the cancer-rate is noticeable as being bottom of the list of killing diseases with only 101 deaths per million of the population; "pyrexia" and infantile convulsions head the list with 4422 and 3028 deaths respectively.

In *Assam*, Schick testing for susceptible contacts in the diphtheria epidemic was most successful, this being the first set of tests carried out in India. Cholera in the absence of preventive measures took 16,000 lives, and "economy" is leaving malaria and kala-azar with a much higher toll than need be, as the public health staffs are being cut down.

The Director of Public Health for the *North-West Frontier* district of India has presented a report (see p. 1038) valuable for many comparisons that it shows, and the figures given of cantonment life ought to be sufficient to impress the authorities with the great and pressing need for extending rather than curtailing the sanitary services. Lieut.-Colonel F. P. Mackie's experiments with cholera vibrios in unripe and over-ripe fruit are mentioned, and the consequent necessity of eating only good fruit is obvious in the presence of an epidemic of cholera. The relative merits of cinchona and quinine are briefly mentioned. Unfortunately, it would seem that retrenchment in health matters is the rule everywhere; one wonders what the national balance-sheet would show if only the losses from this policy could be shown in pounds, shillings, and pence for comparison with the cash saving effected by the curtailment. The jail accommodation is somewhat below the requirements, but notwithstanding this the health of the prisoners was good. Interesting photographs are shown in the Tropical Health Section at Wembley of various jails in India; these give a good impression of the general arrangements and the physique of the men.

IMPERIAL SOCIAL HYGIENE CONGRESS AT WEMBLEY.

MAY 12TH–16TH.

First Day's Proceedings.

Mr. J. Wheatley, the Minister of Health, supported by representatives of the Governments of the Overseas Dominions and India, gave an excellent send-off last Monday at Wembley to this Congress, organised by the National Council for Combating Venereal Diseases. Mr. Wheatley said that he attached great importance to the conference and was pleased at its representative character. He extended a cordial welcome to the delegates from overseas. He specially referred to the results achieved by the mission organised by the National Council, in coöperation with the Colonial Office, which visited the West Indies, the Far East, and the Mediterranean to develop a scheme for the protection of our merchant seamen. In the course of his remarks, he mentioned that in the production and distribution of health we are all Socialists, and, further, that we are all opposed to free trade in disease. Mr. Wheatley concluded by saying he would await the results of the deliberations of the Congress with much interest, as they would be of the greatest assistance to him in settling what modifications of policy were now desirable.

Sir George Newman, Chief Medical Officer of the Ministry, gave an address on the Present Position of Government Action in Venereal Disease, which included an admirable résumé of the attitude to and treatment of venereal disease in the nineteenth century, the great advances in our knowledge of syphilis made in the early years of the twentieth century, and the events which led to the launching of the State-aided scheme for England and Wales in July, 1916. Sir George Newman gave the reasons why the Ministry up to the present time has been opposed to any scheme for notification of these diseases or for compulsory treatment, and he showed why it is impossible for the Government to give its official support to "self-disinfection" or the sale of disinfectants as a policy. The Ministry are of opinion that very much more can be done in the matter of the education of the public than is done at present, and that further facilities and improvements can be made in order to attract patients to the clinics and secure continuity of treatment.

Sir Leslie Mackenzie, member of the Scottish Board of Health, gave particulars of the working of the scheme in Scotland, in which country, as in England, there was evidence of a decline in the prevalence of these diseases since 1920. The Scottish Board had at present under consideration an application for approval to a scheme for notification and securing continuous treatment, and they had not yet given their official reply. He was in favour of more propagandism, and educational facilities had not been used to the full. But he asked, "Is there no case for an experiment in notification?"

At the afternoon session, Dame Rachel Crowdy, Director of the Social Hygiene Section of the League of Nations, read a paper on the Traffic in Women and Children, and explained that the League is only indirectly concerned with prostitution. The advisory committee of the League on this matter has, however, recently issued a questionnaire on the "licensed house" system to all members of the League. Particulars of the replies received up to date were included in Dame Crowdy's paper, and appear to indicate a considerable body of opinion that licensed brothels provide a ready market for the white slave traffic. There was also evidence that prostitutes in licensed brothels contract venereal disease more frequently than those living independently.

Prof. Winifred Cullis (London School of Medicine for Women) put in a strong plea for the teaching of biology, in preference to chemistry and physics, in the elementary schools. It was easy to make it interesting and connect it up with sociology. If taught to elementary scholars, it could readily be continued with adolescents. It ought to be in the curriculum of the training colleges. Unfortunately a regulation of the General Medical Council put obstacles in the way of biological teaching in schools, and she hoped the medical profession would get this regulation abolished.

Dr. F. J. H. Coutts, Ministry of Health, strongly supported Prof. Cullis's plea for the teaching of biology.

Sir Arthur Newsholme, in a paper entitled Some Aspects of Social Hygiene, developed the idea of the right teaching of sex-hygiene, beginning with instruction in self-control from infancy onwards.

Miss Alison Neilans, Secretary of the Association for Moral and Social Hygiene, in an effective speech, said we can do little by law or police, but must change public opinion. They in that hall did not really represent public opinion. According to public opinion prostitution was inevitable. We must alter public opinion by attacking the double standard and getting a re-statement of the basis of sex morals and ethics.

Mrs. Falconer, of the American Social Hygiene Association, also spoke on educational methods.

The first day's proceedings were chiefly set apart for invited speakers. Opportunity for general discussion came later.

Public Health Services.

THE HEALTH OF THE CITY OF LONDON.

THE estimated population of the City for the year 1923 was 13,480. Dr. W. J. Howarth gives in his annual report some interesting particulars from the census returns. For the first half of the nineteenth century the population of the City was stationary at about 125,000, but since 1850, owing to the efforts of the sanitary authority and the demands of business, it has declined census by census to the present figure.

Housing and Personal Health.

The erection of commercial buildings of greater height has "obstructed" many of the remaining dwellings and rendered them "unfit." Thus there are two unhealthy areas waiting to be dealt with as soon as alternative accommodation can be found for the persons to be dehoused, and for these occupants Dr. Howarth suggests tenements should be erected on a site to be obtained as near the City boundaries as possible. Using the standard of two persons to a room as a basis, the census shows that 109 families are living under conditions below such standard. Of the small City population, 1292 males and 571 females work outside its area. On the other hand, the number of persons who live outside the City but come into the City to work daily is 288,626 males and 115,678 females.

The statistics of the small residential population when analysed are founded on figures too small to justify deductions from the comparison between one single year and another; but for 1923 the principal were: Birth-rate 8·2; death-rate 11·5; infant mortality-rate 81; tuberculosis death-rate 1·3; cancer death-rate 1·1; death-rate from respiratory diseases and influenza 1·8; and maternal mortality from childbirth 9·0. A table included in the report shows that cremation does not make rapid progress. Thus the highest total of cremations in the United Kingdom in any one year was 2031 in 1919 and in 1923 the number was 1986. Dr. Howarth quotes Dr. J. S. Owens as being responsible for the statement that London now receives nearly 30 per cent. more sunshine that it did in 1881, and expresses the opinion that if the companies concerned gave special terms for the gas and electricity used for heating and cooking purposes, the further improvement in the atmosphere would be so marked as to create an agitation against the unnecessary use of common coal. It is disappointing to learn that the very successful treatment of parturient women, suffering from syphilis, carried out through the Metropolitan Asylums Board, at Thavies Inn Infirmary, is not used as it might be. The Board think the facilities provided are not sufficiently well known to medical practitioners and a circular letter on the subject has been sent to every practitioner in the City.

Purity of Milk and Bread.

In view of the fact that milk-vendors, prosecuted for selling milk below the standard, frequently allege that the milk has not been tampered with, Dr. Howarth has arranged for some experimental sampling to be undertaken in order to illustrate how easily careless methods on the part of the retailer may lead to an apparent abstraction of fat or even an addition of water. Some of the examples given are the poorness in fat of the last milk in a counter pan emptied by a dip measure, or of the milk from the tap of a churn on a "pram" unless it is regularly stirred with a plunger during its round. Careless distribution of milk from railway churns after a long journey is another example cited, and another less common is the careless thawing of milk which has been in cold storage. A sample of new milk from Holland was reported to contain only 2·38 per cent. of fat. Some vendors of bread are in the habit of exchanging new bread for old, and this is mentioned as a possible means of spreading infection, and the desirability of bread being enclosed in wrappers is also referred to. As wrapping keeps the bread new for a longer period, the general adoption of the latter practice would lead to the disappearance of the former.

Meat Inspection.

Under the heading of meat inspection, Dr. Howarth comments on the large proportion of home-killed pig carcasses affected by tuberculosis. He suggests that there is much carelessness among pig feeders, especially in the use of milk from tuberculous cows. On the other hand, little tuberculosis is found among the carcasses from Holland, which country continues to be the chief source of the pork-supply. The quality of Australian beef has improved and the new method of cutting the hind quarters has given satisfaction to the trade, but there is no improvement in the dressing and finish of New Zealand beef. At the Aldgate slaughter-houses six calves of ages varying from 2 to 9 months were found to be affected with generalised tuberculosis, and in none of these were lesions found in the intestines or mesenteric glands. Fifty per cent. of the cows affected by generalised tuberculosis and 16 per cent. of all the tuberculous cows had lesions in the mammary glands, and three had, in addition, lesions in the uterus. All these cows had been presumably producing milk up to the time of slaughter. These figures, Dr. Howarth points out, confirm the need for the re-introduction of the Tuberculosis Order of 1914. Some authorities wish to have the inflation of carcasses prohibited. As long as a clean mechanical apparatus is used for the purpose, Dr. Howarth considers no strong argument can be advanced against the practice, except that it may give a fictitious value from the improved appearance.

A Diminution of Rats.

The scheme of rat repression shows progress. Thus Mr. Mayne, who is in charge of this work, reports that the proportion of buildings inspected which were found to be infested was considerably lower in 1923 than in 1922. One of the weak points in the scheme is that the responsibility falls on the occupier, and that in many cases considerable structural alterations are necessary in order to obtain a satisfactory result. Buildings may be infested with either the black or the brown rat, and the first step of the rat officer is to find out which species is the cause of trouble. If the black rat is the intruder, the examination of the building begins at the roof; if the brown rat, the inspection begins in the basement, and it is frequently necessary to test the drainage system. The manager of one of the larger railway companies is of opinion that rats are less numerous than formerly, and rat-catchers engaged in the City took fewer rats in 1923, in spite of having contracts with a larger number of City firms.

INFECTIOUS DISEASES IN ENGLAND AND WALES DURING THE WEEK ENDED MAY 3RD, 1924.

Notifications.—The following cases of infectious disease were notified during the week—namely: Small-pox, 132; scarlet fever, 1246; diphtheria, 642; enteric fever, 67; pneumonia, 1357; puerperal fever, 44; cerebro-spinal fever, 11; acute poliomyelitis, 4; acute polioencephalitis, 4; encephalitis lethargica, 278; dysentery, 7; ophthalmia neonatorum, 118. No cases of cholera, plague, or typhus fever were notified. Cases of encephalitis lethargica, more numerous than in any previous week, were notified in the following counties: London, 50; Chester, 6; Derby, 9; Durham, 7; Essex, 5; Gloucester, 14; Kent, 5; Lancaster, 35; Northumberland, 18; Stafford, 9; Surrey, 5; Warwick, 29; Worcester, 4; Yorks, East Riding, 7; West Riding, 42; and elsewhere in smaller number.

Deaths.—In the aggregate of great towns the deaths from influenza fell from 218 to 167. In London the deaths from diphtheria numbered 13 and those from measles fell to 40; deaths from influenza rose from 21 to 27.

Correspondence.

"Audi alteram partem."

THE MEDICAL TREATMENT OF CATARACT.

To the Editor of THE LANCET.

SIR,—I read with interest the article by Mr. Inglis Taylor in THE LANCET of April 5th on the medical treatment of cataract, for I certainly think—and have acted on this for some years now—that we ought to do something more for our cases of commencing cataract than simply tell them to come back to us when they are ripe for operation. In my Doyne Memorial Lecture, read at the Oxford Ophthalmological Congress in August, 1922, I made an attempt to collate and estimate our knowledge of the ætiology of cataract, and I am prepared to welcome any attempt to treat cataract medically. We shall not, however, arrive at any sound line of treatment except from a correct ætiology.

Prophylaxis is most important. I cannot agree with Dor's theory of hydration. Chemically this theory is wrong. For instance, to speak of hydration which implies nothing more than added water in the same breath with ferments which are hydrolytic agents giving rise to chemical decomposition is inaccurate, and ought not to go unchallenged. Hydrolysis, as I have shown, is undoubtedly the first chemical change taking place in the lens in a genuine cataractous process. I omit from this statement coagulation of protein such as occurs when the crystalline is put into a solution of sugar, or in some contusion opacities of the lens which I have seen clear completely in ten days even when vision is as low as 6/60. Calcium taken internally or applied locally may act by reducing the relative acidosis which is so common in subcapsular senile cataract, but in my experience potash is to be preferred, and I think that any resulting good is due to this element, which is a cell food and a normal constituent of the lens. Potash is wanting or deficient in cataract.

I have seen in many cases great improvement in the vision follow from medical treatment. To attempt to treat all alike with any particular remedy without investigating to the best of one's ability the ætiology savours of empiricism. For instance, I have recently seen a case of double spotted cataract, the onset of which coincided remarkably with the development of an ovarian cyst which was eventually removed. The opacities now are, I consider, stationary and may remain so for some years as the patient is considerably below the average age of onset of so-called senile cataract. I see no reason why we should not feed the lens on potash in such a case, but so long as the cause remains operative there would be little chance of a cure. Again, I have shown that there is such a cataract as a "refractive cataract" due to uncorrected error of refraction in early life; the treatment of this is, of course, prophylactic.

The time has come now to study each case of cataract carefully with reference to its ætiology; we must not be content to lump all types together under one heading.—I am, Sir, yours faithfully,

Bath, May 5th, 1924. J. BURDON-COOPER.

A CRITICAL EXAMINATION OF PSYCHO-ANALYSIS.

To the Editor of THE LANCET.

SIR,—Dr. R. M. Riggall in his letter appearing in to-day's issue of THE LANCET charges me with being "incapable of understanding the psycho-analytic conception of the unconscious." This may be correct in a way—namely, in the way in which I am incapable of understanding the conception of ghosts and spirits. It appears to me that the psycho-analyst conception of the unconscious is the result of anthropomorphic tendencies with respect to the inner world, as the creation of ghosts, demons, and deities is the result of the same tendencies with respect to the outer world. Owing to this incapability of mine Dr. Riggall finds it "difficult to know what kind of proof I require." I am sorry, but I cannot help him. I could not say off-hand what proof I should require to convince me of the existence of ghosts and spirits, but I am willing to examine dispassionately and without bias *any* "proof." However, as I said before, the "unconscious," qua unconscious, is not the key-stone of the psycho-analytic arch, for Pierre Janet, Morton Prince, and others assume an unconscious though totally different from the psycho-analytic one. But the assumption of even that sort of "unconscious" is, I hold, quite unnecessary. The key-stone to the psycho-analytic arch is the method of dream-analysis, &c., for penetrating into it. Freud advanced five reasons to show that the results of these analyses were correct, and every one of these five reasons I have, I believe, shown conclusively in my book to be absolutely unsound. All these "analyses" are teeming with suggestion; in fact, Freud himself admits this. Here are his own words: "A psycho-analysis is not an unbiased scientific research, but just a therapeutic intervention. The physician gives in psycho-analysis every time to the patient the respective expectation-ideas by means of which he (the patient) shall be enabled to recognise that which is unconscious and to seize it, sometimes this is done more freely, sometimes less. Just as it happens, some cases require more help, others require less. Without such help no one can get on."[1] After this all argument appears really superfluous, for it shows that dream-interpretation is the *via regia* to the unconscious, not of the patient, as Freud says, but to that of the psycho-analyst, as I suggest. Dr. Riggall's statement that I have not employed the technique myself is an unwarranted assertion, for he would have found evidence to the contrary if he had read my book which he assumes to criticise. Why he persists to harp upon *abreaction* after the quotation from my book given in my last letter to you, if not for the purpose of side-tracking the discussion, I fail to see. As to Dr. Riggall's test-tube analogy reasoning, it suffers from the same defects as Freud's arguments of the same kind and of which I demolished nearly half a dozen in my book. I could easily turn the tables upon Dr. Riggall with this very argument, but I suppose your space is too precious.

I am, Sir, yours faithfully,

Shortlands, Kent, May 10th, 1924. A. WOHLGEMUTH.

WASTING DISEASES OF CHILDHOOD.

To the Editor of THE LANCET.

SIR,—In his comprehensive lectures on the Wasting Disorders of Early Infancy recently published in THE LANCET, Dr. L. G. Parsons makes the statement that xerophthalmia is a rare disease in this country, and mentions that in 13 years only 13 cases were seen at the Birmingham and Midland Hospital for Children. He contrasts this with the condition in Denmark, where he says "the disease has been observed much more frequently," without, however, giving figures.

As this statement may give a wrong impression of the actual incidence of the disease and of the significance of this incidence, I venture to submit the following considerations. Xerophthalmia is a rare disease even in Denmark. A Danish ophthalmologist, Dr. Olaf Blegvad, has collected all the cases of the diseases which have occurred in Denmark during the years 1909–20, and has discussed the importance of this disease in an important monograph of which a summary written by himself has appeared recently in the *American Journal of Ophthalmology*. The total number of cases of xerophthalmia observed in the whole of Denmark during the 12 years 1909–20 is only 445. The disease is, as he points out, an economic disease; it occurs only among the poorer classes. It is, therefore, not admissible to assume that the

[1] Sammlung kleiner Schriften zur Neurosenlehre, 3te Folge, Leipzig, &c., 1913, p. 88.

disease is rare or absent in this country because it happens to be infrequent in one particular locality. It is certainly more frequent in some parts of the country than Dr. Parsons's statement would lead one to believe. For in the fourteenth annual report of the school medical officer for the West Riding of Yorkshire County Council for the year 1921 one doctor, Dr. Tyrrell, discovered 19 cases in two years in one relatively small area. It is possible also that the disease in its mild form is not always recognised and merely regarded as a conjunctivitis. That was the case, for instance, in the previous outbreaks in an industrial school which I quoted in my recent lecture. And in his report on the Health of the School Child, in which not a single case of xerophthalma is reported, Sir George Newman quotes one authority who looks upon diseases of the surfaces of the eye merely as indicating lack of cleanliness.

The importance which attaches to the occurrence of even a few cases of xerophthalmia is this. Xerophthalmia is not merely an affection of the eye, it is part of a general condition of malnutrition due to a deficiency in the fat-soluble vitamin-A, which manifests itself long before the eye disease appears by subnormal growth and weight, by anæmia, general debility, and by a diminished resistance to infection, especially infections of the respiratory tract. Xerophthalmia only sets in when the condition of malnutrition has reached its extreme stage. That means that the ill-effects of a vitamin-A deficiency manifest themselves long before the appearance of the eye affection.

The occurrence of a numerically small number of cases of xerophthalmia in Denmark is taken by Dr. Blegvad not as a measure of the extent of malnutrition, but as a danger-signal disclosing a widespread condition of malnutrition due to the fact that the substitution of margarine for butter among the poorer classes has deprived the latter of an adequate supply of vitamin-A. In this country, according to Sir George Newman's report, out of 700,000 school-children examined, 15,000 suffer from malnutrition and another 15,000 from anæmia, conditions which *may* be due to underfeeding with vitamin-A. In this country margarine has replaced butter among the poorer classes, and cases of xerophthalmia have been discovered in a relatively small area approaching the proportion found in Denmark. The inference seems obvious.

I am, Sir, yours faithfully,

W. CRAMER.

Imperial Cancer Research Fund, London, May 12th, 1924.

THE NARCOTIC ACTION OF PURE ETHER.

To the Editor of THE LANCET.

SIR,—In your issue of May 10th Prof. Storm van Leeuwen states that a 5 per cent. solution of methylethylketone in ether is too toxic to be safe as an anæsthetic agent, because some cats anæsthetised with it on two consecutive days developed hæmorrhages in various organs. As I have used various ketones as anæsthetics for four years (including methylethylketone), I venture to say that I disagree with him. It appears impossible to predict what will be the effect of drugs on man by direct analogy from animals. For example, monkeys very frequently die of pneumonia after the briefest ether anæsthesia, but we do not say that on this account its use is contra-indicated in man.

Before any work on ketones was published, the question of toxicity was thoroughly investigated, and I had anæsthetised over 250 patients with mixtures of various ketones ranging from 0·5 to 10 per cent. in pure ether. It was recognised at the outset that if any ultimate preparation was to have any value as an anæsthetic it must have a mortality-rate lower than 1 in 5000 administrations to compare with the modern techniques employing other drugs. As no toxic effects were observed in the dilutions mentioned above, I next tried a 50 per cent. ketone-ether mixture. This was unsatisfactory, as the mixture was not homogeneous and did not readily vaporise. Pure ketones were next tried with no added ether, and an extremely good anæsthetic resulted. None of these patients vomited at all or exhibited any other after-effects whatever, and the method was only discontinued because some difficulty was experienced in obtaining a suitable vaporiser. The apparatus used consisted of a perforated aluminium plate heated by a resistance coil and mounted in the top of a mask from a Hewitt's wide-bore inhaler. An adjustable pressure-fed drip-feed led the ketone mixture on to the hot plate and the temperature was regulated by a rheostat. This vaporiser required considerable attention to maintain it at a constant temperature, but I have no doubt that if anyone took the time and trouble to construct a thermostatically controlled apparatus this difficulty could be avoided. It seemed to us, however, that the simpler way was to incorporate the ketone mixture in a volatile base, such as pure ether, and thus effect vaporisation without employing heat.

All the ketones used in the above experiments were purchased direct from British and foreign chemical manufacturers, so there is no doubt that they were reasonably pure products. In view of the fact that toxic effects over a period of four years have been at any rate not more pronounced than with other anæsthetics, I suggest that the statement that the use of a 5 per cent. solution of methylethylketone dissolved in purest ether "would be criminal" is, to say the least, somewhat exaggerated.

I am, Sir, yours faithfully,

C. LANGTON HEWER.

Regent's Park, N.W., May 10th, 1924.

THE ARGYLL ROBERTSON PUPIL IN NON-SYPHILITIC CASES.

To the Editor of THE LANCET.

SIR,—The brief annotation on this subject in THE LANCET of May 10th seems rather to suppose the occurrence of the Argyll Robertson pupil apart from neurosyphilis as somewhat of a novelty and the apparent number of such cases as "disconcerting." As a fact, cases of this kind have been familiar to the neurologist for years and have often been recorded. There is abundant evidence of a clinico-pathological kind to associate the Argyll Robertson pupil with lesions in the vicinity of the superior colliculi, and this site, further, has been shown experimentally to be one in which by an appropriate lesion the Argyll Robertson phenomenon can be produced. In the *Journal of Neurology and Psychopathology* for May, 1921, will be found the whole of the subject elucidated at length, with numerous instances of non-syphilitic A.R. pupils. There the evidence pointing to the mesencephalic origin of the phenomenon in a large number of cases is marshalled. Later contributions to the subject substantiating the mid-brain localisations have appeared in the same journal in the numbers for August, 1922, and August, 1923, respectively.

I am, Sir, yours faithfully,

S. A. KINNIER WILSON.

Harley-street, W., May 10th, 1924.

DRIED MILK REGULATIONS.

To the Editor of THE LANCET.

SIR,—May I invite attention to the Public Health (Dried Milk) Regulations, 1923, which came into operation on May 1st. As a physician who has studied dried milk since its adoption in infant feeding after the National Conference on Infant Mortality in 1906, I suggest that these regulations challenge criticism. Dried milk is a distinct boon, especially in India where most of my life has been spent, and I can find nothing to indicate that the numerous

varieties on the market showed such disparity in composition as to call for special legislation. It will be seen that the Ministry consider that milk powder containing only half or three-quarter cream should only be used "under medical advice." This is not the general opinion of pediatricians either in this country or on the Continent. Hutchison says: "Many young infants do very well on half cream dried milk and digest it better than preparations which contain more fat"; and in France half cream is the variety in general use. At a meeting of the Society of Pediatricians of Paris held a year or two ago to specially consider the use of this substance in infant feeding, it was stated, "full cream powder on account of the large amount of fat which it contains keeps badly. . . . Half cream powder is the variety in general use; it complies with most requirements and is the form of dried milk which is the subject of this discussion."

The new regulations place dried milk at some disadvantage as compared with the fresh product as they require a standard of 3·6 per cent. of fat, whereas the legal standard for wet milk is only 3 per cent. It would be interesting to know why there should be different standards for the same article in different forms, but this inconsistency falls into insignificance when we realise that these regulations only concern themselves with dried milks which are accepted by the profession as safe for infant feeding when breast feeding is impossible, whereas no restrictions whatever are placed on the sale of products which are positively dangerous in infant dietary. Infant foods may be classed under three headings—viz., Group 1 consisting of dried milk in various forms, Group 2 consisting of various forms of carbohydrate either malted or designed to be digested in the process of mixing, and Group 3 consisting of unaltered starch. Starch is not a substance which can be given with impunity to young infants, yet the whole of a large group of infant foods consist of this product *pur et simple*. Under the law these products can be sold without let or hindrance, although Hutchison describes one much-advertised product as follows: "A baked flour containing 3 per cent. of soluble carbohydrates, the remainder being starch. Recommended to be made with milk or water. Made with water is totally insufficient food."

The regulations deal with products which are no more harmful in hand feeding of infants than ordinary cow's milk. It appears to me that the Ministry has started legislation at the wrong end.

I am, Sir, yours faithfully,

R. J. BLACKHAM, M.D., M.R.C.P.Edin.,
late Hon. Surgeon to the Viceroy of India.

Harley-street, W., May 7th, 1924.

*** The Health Committee of the Middlesex County Council has recently received a complaint with reference to an infants' food sold as a proprietary article by a drug store in a poor district of the county, and which is stated to have a very large sale. The county analyst's report confirms the statement made that this food consists principally of starch, and lacks the essential constituents of a suitable food for infants. The Health Committee understands that the use of the food in question is doing a great deal of harm to infants who are fed upon it, but there does not seem to be any action which the Council can take under the Sale of Food and Drugs Acts. In 1914 the whole subject of proprietary foods containing large quantities of starch was dealt with in an exhaustive report to the Local Government Board by one of the medical officers of that department, who urged the necessity for legislation to give local authorities power to deal with foods similar to the one under notice. It is probable that but for the war this report would have been acted upon years ago. The Committee is of opinion that the matter should be dealt with by Parliament, and that local authorities should be given power to prevent the sale of harmful food for infants.—ED. L.

TUBERCULIN IN ASTHMA.

To the Editor of THE LANCET.

SIR,—A summary of Mr. Arjeff's results on the treatment of bronchial asthma with tuberculin has recently been recorded.[1] He found this treatment most disappointing. On the other hand, Storm van Leeuwen and Varekamp[2] seem to have had brilliant results. The number treated in both series is small, but even a few cases, when added to one's own observations, are helpful.

I submit, in all modesty, a theory as to the rationale of giving tuberculin in asthma. Dr. Langdon Brown[3] points out that the problems involved in asthma are psychical conditions, peripheral stimuli, foreign proteins, want of endocrine balance, all tending to produce vagotonia, and goes on to say: "I should like to call special attention to enlarged bronchial glands, especially in children, and to suggest that this may explain the liability of healed tuberculosis to excite asthma in susceptible subjects."

We know that children tend to be vagotonic and that, as a rule, they take tuberculin well. We also know that we must observe caution in giving tuberculin to sympathicotonics. The symptoms of active tuberculosis tend to be those of sympathicotonia, and the symptoms of tuberculin poisoning are those of active tuberculosis. I suggest, therefore, that tuberculin stimulates the sympathetic and so antagonises the action of the vagus, thus explaining why an overdose of tuberculin which, on this hypothesis, acts first as a sympathetic stimulant then as a depressant, can bring on an attack of asthma, and also explaining the rapid improvement obtained by van Leeuwen and Varekamp which I have also noted in my cases with the initial small doses.

Tuberculin, except in large doses, causes no disturbance in the non-tuberculous. It seems improbable that the minute doses used in asthma could have any effect whatever unless there be some tuberculous focus present. That such focus is present in some cases of asthma, though not detected by clinical methods, is probable—e.g., the enlarged bronchial glands referred to above. It is stated that two of Arjeff's cases were made worse, and that in nine the tuberculin did not have the slightest effect. These results so differ from those of van Leeuwen and Varekamp and from mine that I cannot but believe there is a fallacy somewhere.

In reading van Leeuwen and Varekamp's paper carefully one is struck by the following points: (1) the small number (4 per cent. only) of asthmatics who gave positive skin reactions to foods, &c.; (2) that persons who react strongly to food tests also give a strong Pirquet reaction; (3) that 30 out of 34 cases of bronchial asthma gave a positive reaction with tuberculin; (4) that very small doses were given and better results were obtained by keeping to these small doses; (5) that in most cases two or three doses of tuberculin were sufficient to cure, but that treatment was continued for two or three months; (6) that on two occasions an attack of asthma was produced by overdosing; (7) that a strong Pirquet reaction does not point to active tuberculosis.

When I turn to my own experience, which is but limited, I find: (1) that in cases in which a modified Pirquet reaction (1 in 10 O.T.) is negative no benefit is obtained from tuberculin unless there is other evidence of disease; (2) that in every case which reacted to tuberculin there was considerable relief of symptoms; (3) that in such cases relief is quickly afforded even after a single dose or two. Believing that tuberculin in some way stimulates the sympathetic and in this way probably liberates adrenalin, I have always begun with a small dose and cautiously increased it, reaching, in some cases, as much as 1 c.cm. of tuberculin.

Summary of the Results.—(*a*) Cases which reacted to tuberculin or who had obvious signs of tuberculosis,

[1] Brit. Med. Jour., Sept. 3rd, 1923.
[2] THE LANCET, 1921, ii., 1366.
[3] Roy. Soc. Med. Proc., January, 1923.

10—asthma apparently benefited or cured in all; (*b*) cases which did not react to tuberculin, 3—apparently no benefit in any. The following points are of interest: (1) the successful cases were mostly subsensitive to the tuberculin cutaneous tests—i.e., they reacted to dilutions of 1 in 10, but not to higher dilutions; (2) the blood pressure, generally speaking, was fairly high—130 or over; (3) in nearly all cases there was considerable fibrosis as shown by X rays.

My thanks are due to Dr. F. Hernaman-Johnson for X ray reports, and to Dr. H. A. Ellis for taking the tuberculin cutaneous reactions.

I am, Sir, yours faithfully,

F. E. GUNTER, M.D. Edin.,
Lt.-Col., R.A.M.C. (ret.); Asst. Phys. Margaret-street Hosp. for Consumption and Diseases of the Chest.

May 12th, 1924.

SIGNS OF INSANITY.

To the Editor of THE LANCET.

SIR,—In view of the importance which we are nowadays told is to be attached to isolated facts, as indications of insanity, it may be of interest to some of your readers to consider the evidential value of the accompanying letter, which I recently received from a patient under my care. Does the letter, which is a perfectly grammatical and intelligible production, indicate insanity, and if so, why? One wonders what a jury would think about it. I should add that the enclosure is by no means the entire letter, but only its first sentence.

I am, Sir, yours faithfully,

York, May 7th, 1924. HENRY YELLOWLEES, M.D.

[ENCLOSURE.]

DEAR SIR,—Your assistant, Dr. M., was in the gallery on my return thither to-day after my matutinal round, an hour or two of which had been incidentally devoted to the project of consuming as rapidly as possible, with the idea of obtaining a good blaze, some recalcitrant tree roots, laurel clippings, ivy leaves, and other rubbish of a vegetable character which had been, or was in process of being, wheeled into the manure compound, and to take up the "thread" I enquired from him, in the absence of an announcement, as to the upshot of the consideration of—to me—the most important item on your agenda for last Tuesday's Committee meeting, and I was half inclined—in view of what I at first conceived to be—and perhaps too hastily—either a breach of etiquette or business routine—to confide in him the details of the cogent, personal matter in the negotiation of which, metaphorically speaking at any rate, you might almost be regarded as my plenipotentiary; but on ascertaining from Dr. M. after sounding him as to the practicability of an interview that when he left you this morning there was a "string" of six or seven people awaiting an audience, I deemed it preferable to await developments and avail myself of his suggestion to write to you!

DONATIONS AND BEQUESTS.—The late Sir Alexander Grigor Jeans, of Cheshire, editor and managing director of Liverpool newspapers, left by will £250 to the Liverpool Royal Infirmary; £100 to the Liverpool Northern Hospital; £100 to the Liverpool Southern Hospital; and £100 to the Birkenhead Borough Hospital.—By will the late Mr. Robert Pauling, of Kingston-on-Hull, Yorks, left £500 to the Hull Infirmary; £250 to St. Dunstan's Hostel; £200 to the Victoria Hospital for Children, Hull; £200 to the Hull Orthopædic Institute; £200 to the Hull and Sculcoates Dispensary; and £200 to the Hull Institute for the Deaf and Dumb.

PADDINGTON GREEN CHILDREN'S HOSPITAL.—With an increase in the number of patients treated during the year, an expenditure which exceeded the income by £1339, and a debt at the bank of £13,500, the committee of this institution make an earnest appeal for additional financial support. The total number of in-patients treated in 1923, the year with which the report deals, was 869 as compared with 750 in the previous year, or an increase of 119; while new out-patients numbered 12,122, as compared with 11,498 in 1922, an increase of 624. The number of attendances in the out-patient department in 1923 was 43,731 in contrast with 39,778 in the preceding year—an increase of 3953. The average stay in hospital of the in-patients was, roughly, 14 days in both 1922 and in 1923, but the average cost per patient for this period was, in the latter year, reduced from £8 10*s.* 8*d.* to £7 8*s.* 10*d.* During the year 1923, 113 patients were sent to the Convalescent Home at Slough, where the average stay is 35 days, the cost per patient being a little over £2 5*s.* a week. Towards the cost of maintenance of these convalescents parents contributed a sum of £126.

Obituary.

SAMUEL GEORGE SHATTOCK, F.R.S., F.R.C.S.ENG.

Samuel George Shattock, Professor of Morbid Anatomy in the University of London, who died at Wimbledon on May 11th after six months' serious illness, will be mourned not only by his colleagues and pupils at St. Thomas's Hospital and at the Royal College of Surgeons of England, but by pathologists throughout the civilised world, for his reputation was international. Born in 1852, he was educated at University College School and entered University College, London, as a medical student in 1869, qualifying M.R.C.S. Eng. in 1874. In 1875 he was awarded the Liston gold medal at University College Hospital and became interested in descriptive pathology as early as 1876, when he began a catalogue of the surgical pathology of the museum at

PROFESSOR SHATTOCK.

University College, London, under the supervision of Mr. Marcus Beck. In 1878 he started an original investigation on the reparative processes that occur in vegetable tissues, and in the same year began to outline the attachments of the muscles on a series of human bones, now permanently exhibited in the anatomical collection of the Museum of the Royal College of Surgeons. He was then elected as Curator of the Pathological and Anatomical Museum, University College. In 1881 Shattock became a Fellow of the Royal College of Surgeons of England, and in 1884 was appointed Curator of the Museum at St. Thomas's Hospital, London, so that his association with both these institutions extends over more than 40 years. In 1884 also he was elected on the Morbid Growths Committee of the Pathological Society of London, and the next year a member of the Council of the Society. At this time he started an optional class on surgical pathology at St. Thomas's, which in 1886 became an official class. These were the first classes in surgical pathology given in London, and in 1888, as newly-appointed lecturer in surgical pathology, Shattock delivered the first course of lectures on surgical

pathology ever held in London. The next year he started work on a new pathological catalogue of the museum at St. Thomas's Hospital, a task which engaged much of his time until 1894, when it was completed. In this year he gave the Morton lecture on cancer at the Royal College of Surgeons, and in 1895, for the first time, a private short course on practical bacteriology at St. Thomas's Hospital.

Meanwhile Shattock's work in pathological research had attracted attention, and he had been made successively secretary and vice-president both of the Pathological Society of London and of the Pathological Section of the B.M.A. annual meetings, and an assistant editor of the *Journal of Pathology and Bacteriology*. He contributed papers chronicling an attempt to cultivate protozoa from malignant tumours, jointly with Sir Charles Ballance, and on the healing of incisions in vegetable tissues to the Royal Society, and was selected to write the article on General Pathology of New Growths in Sir Clifford Allbutt's "System of Medicine." Shattock became a member of the Council of the British Institute of Preventive Medicine (now the Lister Institute) in 1896, and the next year was made Pathological Curator at the Royal College of Surgeons, London, holding this appointment jointly with his posts at St. Thomas's Medical School. In 1899 he was made editor of the Transactions of the Pathological Society, and in the same year was appointed external examiner in pathology of the Victoria University (Manchester). In 1904 he was made examiner in pathology at the University of London, with Dr. Sidney Martin; this was the first occasion on which a separate examination was conducted by special examiners in pathology. In 1907 Shattock was elected first President of the Section of Pathology of the Royal Society of Medicine, and was also elected representative of the section on the Editorial Committee of this newly-formed Society, and a member of the Council. Prof. Shattock first gave lectures and demonstrations at the Royal College of Surgeons in 1909, when he delivered two Hunterian lectures on Certain Matters connected with Internal Secretion and Certain Matters Connected with Fat. At this period he began a new edition of the pathological catalogue, of the Royal College, with the aid of Mr. C. F. Beadles. He determined to make a special feature of the general pathology, and many specimens were transferred from the groups illustrating special pathology to that of general pathology. In 1910 he became President of the Section of Pathology at the meeting of the B.M.A. in July and was made a Fellow of University College, London. In 1913 he was made President of the Section of General Pathology and Pathological Anatomy at the International Congress of Medicine which met in London, and gave the introductory address. He spoke of the large proportion of scientific work which was unattended by positive results. This necessarily followed from the incalculable complexity of what was investigated, as contrasted with the limitations of the researching instrument—the investigator. The temptation to substitute conjecture and verbal formulæ for accurate knowledge, common to all workers, should, he said, be fought most strenuously, and by example as well as precept Shattock throughout his life taught this lesson. In 1916 he received the diploma of the Honorary Fellowship of the Royal Society of Medicine as a recognition of scientific work, and the next year was elected Fellow of the Royal Society of London. In the same year he was appointed to select, with the help of Mr. Beadles, specimens for permanent preservation from the large number of specimens of gunshot injuries received from the seat of the war, and in 1922 began recataloguing the specimens of special pathology at the Royal College of Surgeons, a work which has not been completed at the time of his death.

Shattock's academic activities and his work in descriptive pathology might well have fully occupied his professional life; and, indeed, it is probable that he will be best remembered as a great pathological anatomist. But he also devoted considerable attention to the study of cancer, and it was his habit, whenever possible, to apply the experimental method to the problems of morbid anatomy. Further, he was one of the earliest students and teachers of bacteriology in this country. His influence on the surgical pathology of our time is almost impossible to assess, for besides the work which appears over his name very many of the surgical monographs published at the present time bear willing evidence to the unofficial help and inspiration he has given to the writers. Always a reserved man, few among his colleagues had any part in his private life. His interests were always those of the student, and for upwards of 40 years every moment he could spare from his professional work were spent in compiling and elaborating notes on religion and kindred subjects which, by his wish, will be published posthumously.

A fellow-pathologist writes:—"Although it has been generally known that the state of his health has for some time been such as to give rise to grave anxiety, the news of Shattock's death must inevitably come as a severe shock. For so many years he has occupied such a prominent place in scientific medicine that it is scarcely possible to realise that his life's work is really at an end. As a teacher of pathology few men have played a more important part. It is difficult for the modern student to visualise a curriculum which contained no recognised teaching in pathology, and it is well for us to realise that had it not been for the devotion and enthusiasm of such men as Shattock the study of scientific medicine in London could never have reached its present level. Above everything else a morbid anatomist, a great part of his life's work was given to the pathological museums of St. Thomas's Hospital and the Royal College of Surgeons; the pathological collection of the College is itself a monument to his untiring energy and skill. The story of Shattock's life is intimately bound up with that of the Pathological Society of London and the Royal Society of Medicine. For close on half a century he was one of the mainstays of the Society. Though of late years he rarely attended the laboratory meetings, he was scarcely ever absent from the more formal meetings in the old days in Hanover-square and later in Wimpole-street. The actual bulk of his contributions to the Transactions on a great variety of subjects must be very considerable, but possibly of even greater value were his contributions to debates and his personal influence. Himself a most accurate worker and a man of great learning, he insisted on a high standard, and though from time to time his junior colleagues may perhaps have realised with some chagrin that there is indeed nothing new under the sun, his criticisms were always stimulating. And no man ever applied to him for help and assistance in vain. A great student, a great teacher, and an upright man, Shattock made for himself a place which it is doubtful if another can ever fill."

The following appreciation is from a colleague at the Royal College of Surgeons of many years' standing:—

"The death of Prof. Samuel Shattock removes a familiar and affectionately regarded figure, not only from the Museum and Library of the Royal College of Surgeons and from St. Thomas's, but also from Wimbledon. Seeing this remarkable old savant in the costume of a bygone generation of medical men, the fine musing face touched at times with a kindly smile under the broad-brimmed top hat of a shape that defied all changes of fashion, the highly individual ambling gait, the immemorial black bag of ample dimensions—seeing these, people familiar with his aspect in their daily walks have wondered who "the old professor" might be, and have been justly rebuked and surprised when informed that he was one of the acknowledged chiefs of the world of science, and especially of his own world of pathological anatomy. He had, indeed, accomplished an infinity of work on the lines of the Hunterian tradition at the

Royal College of Surgeons, where his best monument is Room III., on the floor of which, during 1923, he had finally arranged the magnificent collection of specimens illustrative of the principles of pathology. Jointly with Mr. Cecil Beadles, Shattock had begun to select, arrange, and catalogue specimens as long ago as 1910, 'thus laying the basis of the scheme which they have now brought to a most successful issue.' The words quoted are from Sir Arthur Keith's museum report for 1923, where a full and interesting account of Shattock's recent work in general pathology will be found. Death intervened before he could finish his last great undertaking—the arrangement of the Section of General Pathology. An ardent worker, a man of the greatest acumen and scientific learning, Shattock remained much of a mystery to the colleagues about him. It has taken one of them half a lifetime to find out that he knew all the names of the Derby winners for some 100 years, that he was a devotee of cricket, never missed an opportunity of going to see a match at Lords, and was an authority on cricket scores; also that he was very musical and an excellent executant, and a very kindly genial gentleman, both at his own Wimbledon home and in his museum laboratories."

Prof. Shattock leaves a widow, one daughter, and three sons, of whom one, Mr. C. E. Shattock, is surgeon to the Royal Free Hospital.

GEORGE HENRY OLIVER, L.R.C.P. LOND.

Dr. G. H. Oliver, consulting ophthalmic surgeon to the Royal Eye and Ear Hospital, Bradford, died recently at his residence in Bradford after a long illness. Born in 1861, he received his education in Leeds and Vienna, and qualified in medicine in 1885 as L.S.A. and M.R.C.S. Eng. Three years later he obtained the L.R.C.P. Lond. He laid the foundations for successful ophthalmological work at the outset of his career; after qualifying he held the position of demonstrator of anatomy in the University of Leeds, thus acquiring a thorough knowledge of general anatomy, and subsequently in Vienna he devoted himself to the study of the eye. On his return to England he began his professional life in general practice first at Clayton and shortly afterwards in Bradford, but he gradually limited his work to ophthalmology alone and was appointed hon. surgeon to the Bradford Eye and Ear Infirmary, a position which he held until 1921, when, at the age of 60, he was appointed to the consulting staff.

Dr. Oliver kept himself abreast of the latest developments in his specialty and, while connected with the Bradford Infirmary he frequently obtained leave to visit centres where special original work was being done in order to get first-hand information. When the Oxford Ophthalmological Congress was founded in 1909 he was one of its original members. In 1913 he gained the Oxford Diploma in Ophthalmology and remained for a time as lecturer in ophthalmology at Oxford University. He also held appointments as ophthalmic surgeon to the Health Committee of Bradford City Corporation and to St. Luke's Municipal Hospital, Bradford. During the war he was officer in command of No. 84 Ophthalmic Centre War Hospital, and was ophthalmic surgeon to the Bradford War Hospital. In 1922 he was President of the Bradford Division of the British Medical Association. Dr. Oliver contributed many articles to medical journals on his own subject.

A colleague writes of him: "An indefatigable worker, Dr. Oliver was simple in his tastes and lived for his profession. He was a good pathologist, examining every case with meticulous care, and as a refractionist he was exceptionally quick. His love of reading bore fruit in the excellent collection of the latest English and German ophthalmological works in the library of the Bradford Infirmary, where he acted as curator. He was a great favourite with his patients no less than with his medical friends and colleagues, and he will be greatly missed."

DAVID NEWMAN, M.D., C.M., F.R.F.P.S. GLASG.

Dr. David Newman, hon. consulting surgeon to the Glasgow Royal Infirmary, died recently at sea in his seventy-second year. A son of Edward Newman, M.D., Fleet Surgeon, R.N., he was educated at the Glasgow Academy, and proceeded to the study of medicine at Glasgow University, where he qualified M.B., C.M. in 1878. He continued his medical studies at the University of Leipzig, and in 1881 became a Fellow of the Royal Faculty of Physicians and Surgeons of Glasgow, gaining his M.D. Glasg. with high commendation two years later. Dr. Newman devoted himself early in his career to the special branch of genito-urinary surgery, on which he published in the course of his life-time many valuable treatises, both in book form and as articles in various surgical manuals, medical encyclopædias, and medical journals. Of his life and work a friend and colleague sends us the following account:—

About 35 years ago Dr. Newman first demonstrated the cystoscope to the writer, an instrument regarded then as more or less a scientific toy, but shown by the demonstrator to be an instrument of precision. At that time the surgery of the urinary apparatus was ill-defined and crude: the work of Newman helped very materially to make diagnosis more exact, to lay foundations for certitude in operative procedure, and to widen the range of knowledge in anatomy and physiology. Newman worked for some years along other lines before finding his true métier. About 1880 he was pathological chemist in the Western Infirmary and assistant to Dr. Joseph Coats, pathologist to the infirmary, and at that time he realised the essential value of what we now call chemical pathology. Some years later he became pathologist in the Royal Infirmary, where he carried out his investigations into the malformations and malpositions of the kidneys. He next adventured in the region of diseases of the nose and throat, becoming in 1890 surgeon to the throat department of the infirmary. The outcome of this period of his career was the volume on Malignant Disease of the Throat and Nose. When, in 1893, Dr. Newman was appointed surgeon to the Royal Infirmary of Glasgow, he was already a man of some note, possessed of varied experience and a basic training in pathology. He became rapidly known as an authority on the surgery of the kidney and published several works on its surgical diseases. To a large extent his work was pioneer work and demanded originality of outlook and pertinacity in investigation. His reputation was considerably beyond the confines of his own school, and he was recognised as an authority in the schools abroad—this recognition taking practical form when he was invited to open a discussion on the surgery of the kidney at the annual meeting of the British Medical Association in 1908, and to become vice-president of the Urological Section of the International Congress in London in 1913. He was visiting surgeon to the Royal Infirmary for 21 years. There were but few students in the Royal in those days before the war, but when opportunity offered he proved himself to be a good teacher and a lucid, forceful lecturer. He was probably more at home demonstrating to the medical societies in Glasgow, where his audiences were men of experience in practice.

Dr. Newman was a man of good friendship within his own circle, and his death adds yet another to the recent losses in the surgical world of Glasgow.

JOSEPH HENRY WILKS, M.B., B.CH. CAMB.

BY the lamented death of Dr. Wilks, from encephalitis lethargica, at the age of 58 years, the medical profession of Sheffield has suffered a great loss. The eldest son of Mr. Edward John Wilks, principal of Messrs. Wilks Bros., ironmongers, he received his early education at the Wesley College, Sheffield, going on to Caius College, Cambridge, where he took his degree in 1887. His medical training began at the Sheffield School of Medicine, was continued at Cambridge and St. Bartholomew's Hospital, London. After graduating in medicine in 1891, he held appointments at the West London and Bethlem Hospitals, and was clinical assistant at the Royal Ophthalmic Hospital. In 1898 he succeeded Dr. J. Black Milne on the honorary staff of the Sheffield Children's Hospital, to which he devoted self-denying service over many years. During the war he rendered able help at the Wharncliffe War Hospital.

A medical friend writes:

"Dr. Wilks was a general practitioner of the best type. Upright, conscientious, and unselfish, he carried on his work amongst the people for over 30 years without any thought of personal aggrandisement or self-glorification. Those of us who had an opportunity of seeing something of that work knew the care and trouble with which every case was always investigated and watched, and the amount of thought and attention which he gave to every detail which might relieve or aid his patient. Although fully capable of so doing had he desired it, Wilks took little or no active or public part in the medical or civic affairs of the city. By nature he was modest and retiring, and was contented and happy in carrying out thoroughly and well 'the daily round, the common task.' His end came as he would have wished, whilst still in the midst of full work."

Dr. Wilks was taken ill one evening whilst making a professional call, and although at first the symptoms did not appear to be of a dangerous character so that he was able to leave home for what all hoped was a convalescent holiday, developments of a serious kind supervened, and the end came with tragic suddenness. He leaves a widow and two daughters.

THE LATE DR. H. A. BULL: AN APPEAL.

WE have received an appeal on behalf of the widow and three children of the late Dr. Bull of Great Haywood, who, by his untimely death, have been left extremely ill-provided for. For some three years Dr. Bull suffered from abdominal disease requiring several operations and long absences from duty, and it is estimated that the capitalisation of all his resources will realise less than £200 per annum. We set out briefly last week Dr. Bull's services to the medical profession and to the community. He was hon. treasurer for many years of the Staffordshire Panel Committee, a member of the County Council and many of its committees, a member of the Conjoint Tuberculosis Board and of the County Insurance Committee; on all of which he worked in the interests of his fellow practitioners. Dr. W. D. Carruthers, county medical officer of health, has agreed to act as hon. treasurer to the fund, and subscriptions should be sent to him at Martin-street, Stafford. The appeal is signed by Dr. T. Ridley Bailey, chairman, and Dr. George L. Lefevre, secretary of the Staffordshire Panel Committee.

THE LATE DR. R. GRAY.—Dr. Robert Gray, of Armagh, died on April 25th, aged 79. Educated at Armagh School and at the schools of the Royal College of Surgeons in Ireland, he qualified L.R.C.S.I. in 1865, two years later he obtained the L.R.C.P. Edin., and subsequently the L.S.A. Lond. In 1872, a year previous to obtaining the L.R.C.P.I., Dr. Gray was appointed medical officer of Armagh dispensary district, a position which he held for some 43 years when he was succeeded by his eldest son, Dr. H. A. Gray. He also enjoyed an extensive general practice. He became a Fellow of the Royal College of Physicians of Ireland in 1895, and Sheriff for County Armagh when he retired in 1915. He was president of the North of Ireland Branch of the British Medical Association in 1897–98. He was also president of the Armagh Natural History and Philosophical Society, and at one time president of the Irish Medical Association. He was an active Freemason, and took a prominent interest in the Church.

THE LATE DR. J. A. FRASER.—James Alexander Fraser, L.R.C.P. Lond., who died on May 8th in his seventieth year, was a well-known medical man in Romford, Essex. He was a member of a distinguished Highland family, was born in Mauritius, and educated at Blackheath and Merton College, Oxford, taking his medical training at Guy's Hospital. During his student days he was a noted Rugby football player. Over 40 years ago he set up in practice at Romford, and for 35 years he held the office of medical superintendent at the Romford Poor-law Institution. He was also consulting surgeon to the Victoria Cottage Hospital for many years. Dr. Fraser was highly esteemed and respected in the neighbourhood, and his death is keenly felt by the community.

Parliamentary Intelligence.

NOTES ON CURRENT TOPICS.

Poor-law Reform.

BEFORE the third reading of Local Authorities (Emergency Provisions) Bill on Monday, May 12th, some discussion took place as to the Government's attitude in regard to Poor-law reform. Mr. GREENWOOD (Parliamentary Secretary to the Ministry of Health) stated that communications were now passing between the three parties with the object of bringing about a conference between them in order that so far as practicable an agreed measure might be reached. In the opinion of the Government that was a speedier and on the whole a more desirable method of procedure than that of a Royal Commission or of a Departmental Committee. If the leaders of the various parties could agree to a conference the Ministry of Health would put before it definite proposals both as to procedure and policy.

HOUSE OF COMMONS.

WEDNESDAY, MAY 7TH.

The Insured Population.

Sir THOMAS ROBINSON asked the Minister of Labour the number of men, women, boys, and girls, respectively, insured under the National Health and Unemployment schemes, respectively, in 1913 and at the latest possible date.—Mr. THOMAS SHAW replied: The following are the available figures for Great Britain:—

Year.	Health insurance.			
	Men.	Boys (16–18 years).	Women.	Girls (16–18 years).
1913	9,645,000		4,005,000	
1923	10,200,000		4,800,000	
	Unemployment insurance.			
1913	2,250,000			
1923	7,830,000	540,000	2,500,000	380,000

At the date of the last valuation of Approved Societies (December, 1918) males and females between the ages of 16 and 18 years insured under Health Insurance scheme were 6 per cent. and 10 per cent., respectively, of the total numbers of males and females. In 1913 those insured against unemployment consisted almost wholly of males.

Washington Maternity Convention.

Mrs. WINTRINGHAM asked the Minister of Health whether he intended that the terms of reference of the Royal Commission on National Insurance would allow for consideration of the possibility of the ratification by this country of the Washington Maternity Convention of the International Labour Office.—Mr. WHEATLEY replied: I think the terms of reference given in my reply to the hon. Member for West Woolwich on May 1st would enable the recommendations of the Washington Maternity Convention to be considered as regards applicability to the insured population of the country.

Hygienic Qualities of Milk.

Mrs. WINTRINGHAM asked the Minister of Health whether the reports of his inspectors showed that the public could rely on the high hygienic quality of the large quantities of milk described on sale as nursery, invalids, or guaranteed; and, if not, whether he would consider how the public might be safeguarded in the matter.—Mr. WHEATLEY replied: According to the information in my possession the answer to the first part of the question is "No." I will consider what steps it may be practicable to take to safeguard the public in this matter, but in the meantime I think the consumer would be well advised not to place too much reliance on descriptions and designations implying special hygienic qualities other than those authorised by the Milk (Special Designations) Order.

Salaries of Public Health Nurses.

Mrs. WINTRINGHAM asked the Minister of Health whether he was aware that many local authorities were paying to trained nurses engaged in public health work salaries as low as £130 per annum; and whether he would take steps to ensure them an adequate salary, in view of the importance of health-visiting, in the prevention of infant mortality, and the long period of training and other qualifications which candidates for these appointments were expected to hold.—

Mr. WHEATLEY replied: According to the information in the possession of my department, payment of a rate of salary as low as £130 per annum is exceptional. I fully appreciate the importance of the work of health visitors, and the question of their salaries will continue to engage my attention.

Training Centres for Blind Persons.

Mr. GRAHAM WHITE asked the Minister of Health the number of workshops, hostels, and training centres for blind persons which had been opened since the Blind Persons Act, 1920, came into operation.—Mr. WHEATLEY replied: Since the Blind Persons Act, 1920, came into operation six new workshops have been opened and one is now in course of erection. Considerable extensions have been made or are in progress in connexion with eight existing workshops. Three new hostels for blind workers have been opened and one extended. Training centres are under the control of the Board of Education, but I am informed by my right hon. friend that the Board have recognised 12 new centres, eight new hostels, and extensions to two centres for training purposes.

Spirochætosis in Scotland.

Mr. CLARKE asked the Under Secretary to the Scottish Board of Health if he was aware that there had been another outbreak of spirochætosis (rat-bite disease) in the same colliery in East Lothian; in view of this, would he take steps to institute a public inquiry so as to give assurance to the miners employed in that district; and was he aware that in one of the pits a section was stopped, with the result that no outbreak had been reported as having taken place since the date of stoppage.—Mr. ADAMSON (Secretary for Scotland) replied: I am aware that a fresh case is being treated in the Royal Infirmary, Edinburgh. I am having full inquiry made as to the circumstances of the outbreak, and when I have received the report I shall consult with the Secretary for Mines as to the expediency of holding a public inquiry. I have no information as to the last part of the question.

Cost of Medical Benefit Bill.

Mr. MASTERMAN asked the Chancellor of the Exchequer how much Government grant would be required by the operations of the National Health Insurance (Cost of Medical Benefit) Bill; how much of the amount required for this year was provided in the Civil Service Estimates; and what would be the total cost of this national expenditure in a normal year.—Mr. W. GRAHAM (Financial Secretary to the Treasury) replied: The National Health Insurance (Cost of Medical Benefit) Bill is estimated to involve an additional charge on the Exchequer of £392,000 in a normal year, but in the current year Supplementary Estimates will be presented in due course to provide £490,000 for the period of 15 months from Jan. 1st, 1924, to March 31st, 1925, no provision having been included for this purpose in the current Estimates.

Pasteurised Milk Regulations.

Mrs. WINTRINGHAM asked the Minister of Health whether he was aware that a large part of the milk sold as raw milk in our large cities had been pasteurised or otherwise treated by heat; and whether he was prepared to take steps to ensure that purchasers might know whether their milk had been so treated.—Mr. WHEATLEY replied: Yes, and, while I am doubtful whether it will prove practicable to take effective steps in the direction suggested, I will consider the hon. Member's proposal. I am hopeful that the provisions of the Milk (Special Designations) Order, 1923, as to the use of the term "pasteurised" may contribute to the enlightenment of consumers and lead to the disuse of unapproved processes.

THURSDAY, MAY 8TH.

Hospital Observation of ex-Service Men.

Captain RAMAGE asked the Minister of Pensions what regulations, if any, were now in force whereby disabled ex-Service men were placed in hospital for the purpose of observation; what was the object of this period of observation; and was any compensation paid to the men concerned in cases where they had suffered financial loss through loss of time while under observation.—Mr. F. O. ROBERTS replied: In exceptional cases it is the practice to admit a man to hospital for medical observation with a view to the proper determination of his case. If the disability has been accepted by the Ministry as due to or still aggravated by service full treatment allowances for a man and his family are paid; in other cases allowances are paid in respect of his family.

Schools for the Deaf.

Mr. GRAHAM WHITE asked the President of the Board of Education the present accommodation in the certified special schools for the deaf, and the approximate number of deaf and dumb children in the country.—Mr. C. TREVELYAN replied: The present accommodation in certified special schools for the deaf is 4582. The approximate number of deaf children in the country (including those who are partially deaf) based on returns furnished by local education authorities in respect of the year 1923 is 5700.

Medical Examination of Young Persons in Factories.

Lieut.-Colonel FREMANTLE asked the Secretary of State for the Home Department when the report was likely to be published of the committee appointed to inquire into the working of the provisions of the Factory and Workshops Acts for the medical examination of young persons as to their fitness for employment in factories.—Mr. HENDERSON replied: This report, which I have just received, will be presented at once to Parliament, and copies will be available, I hope, by the end of next week.

Dissection of a Body at Cleator Moor.

Mr. GAVAN-DUFFY asked the Secretary of State for the Home Department if he was aware that since the unlawful dissection of the body of J. M. Ashton at Cleator Moor, and the removal of the deceased man's brains without the widow's knowledge or consent, an application had been made by the legal representatives of the insurance company for a further examination, and, as the widow had withheld her consent, the insurance company now refused to undertake the cost of giving Christian burial to the part of the man's body unlawfully abstracted; and would he submit the matter for the consideration of the Public Prosecutor with the object of proceedings being taken against those concerned.—Mr. HENDERSON replied: As this case contains some element of doubt as to the legal position, I propose to send the information in my possession to the Director of Public Prosecutions for his consideration.

Final Pension Awards.

Mr. ERNEST BROWN asked the Minister of Pensions if he would make any statement as to the final awards of Service men's pensions, and especially as to the problem of recurring diseases and ailments.—Mr. F. O. ROBERTS replied: Cases of recurrent ailments are met by the provision of medical treatment, with the grant of allowances if necessary. As regards cases in which it is shown that an award was erroneously declared final at the time it was made owing to a definite error of fact or judgment, I am glad to be able to assure the hon. Member that cases of this kind are now, in fact, being put right by the Ministry, and the correct award, whether final or conditional, made in lieu of the award which had erroneously been made final. Where a man claims to need treatment on account of his condition his case will be considered if as a result of medical treatment and observation error is discovered. Such claims go in the ordinary course through the local offices of the Ministry.

MONDAY, MAY 12TH.

Medical Services in India.

Mr. SNELL asked the Under Secretary of State for India whether he was aware that the recommendations of the Medical Services Committee were forwarded by the Government of India to the Secretary of State for decision some two years ago; that no decision had yet been given by the Secretary of State for India, especially about the transfer of certain appointments ordinarily held by the Indian Medical Service officers to the provincial medical services in the various provinces; that the question regarding medical research and the reduction of the military assistant surgeons and sub-assistant surgeons, forming part of the recommendations, was still undecided; and whether, in view of the protests made lately in the Indian Legislative Assembly, he would undertake to expedite his decision.—Mr. RICHARDS replied: It has been found impossible to adopt the fundamental proposal of the Medical Services Committee—i.e., the creation of a single medical service in India. I am sending the hon. Member a copy of a paper showing the extent to which civil posts are now reserved for Indian Medical Service officers in the provinces. With the addition of posts under the Central Government these number 333, as compared with 380 recommended for reservation by the Committee and 422 before the war. In the interests of economy the research service has been reduced to a skeleton cadre of six posts, all held by Indian Medical Service officers. In the case of military assistant surgeons no question of reservation arises, and the provincial authorities are, I believe, in some cases effecting reductions. In regard to sub-assistant surgeons I am not clear what information the hon. Member desires.

Pensioners and Medical Treatment.

Mr. ERNEST BROWN asked the Minister of Pensions whether his attention had been called to the fact that many ex-Service men who no longer enjoyed any pension were in

receipt of treatment and received treatment allowances on account of the fact that their illness was consequent on service; and whether he was prepared to allow such men to re-open their claim to pension, the receipt of which in many cases would tend to prevent the recurrence of the illness which entitled them to treatment and treatment allowances.—Mr. J. W. MUIR (Parliamentary Secretary to the Ministry of Pensions) replied: I am glad to say that comparatively few of the men who have received final awards of the class referred to are, according to my information, in receipt of medical treatment. The need of treatment in consequence of temporary fluctuation of condition does not necessarily indicate that the final award made was erroneous, though where it is demonstrated, as a result of treatment, that serious error has occurred, the case will be put right in accordance with the procedure indicated in the answer which my right hon. friend gave the hon. Member on the 8th inst.

The White Lead Convention.

Sir PHILIP LLOYD-GREAME asked the Home Secretary whether it was the intention of the Government to ratify the White Lead Convention; and, if so, whether, and on what occasion, the Government proposed to obtain the approval of the House of Commons to such ratification.—Mr. DAVIES (Under Secretary for the Home Office) replied: The Government have introduced the Lead Paint Bill with the express purpose of giving effect to the provisions of the draft convention, and if Parliament accept the Bill and pass it without any amendments inconsistent with the Convention, it is proposed to ratify the Convention.

Retirement of Coroners.

Brigadier-General SPEARS asked the Home Secretary whether there was any retiring age for coroners; and, if not, how many coroners there were over the age of 75.—Mr. DAVIES replied: The answer to the first part of the question is in the negative. I have no information as to the age of coroners now holding office.

Clearance of Slum Areas.

Captain REGINALD TERRELL asked the Minister of Labour whether any towns were availing themselves of the Government subsidies hitherto sanctioned by the House to clear and rebuild on slum areas.—Mr. WHEATLEY replied: 57 local authorities have submitted schemes for the improvement of insanitary areas on the basis of financial assistance provided either under the Housing, &c., Act, 1919, or the Housing, &c., Act, 1923. In addition, about 40 local authorities have schemes in course of preparation or under consideration.

TUESDAY, MAY 13TH.

Conditions of Asylum Workers.

Mr. HORE-BELISHA asked the Minister of Health whether the proposed Royal Commission to inquire into the Lunacy Laws would be empowered to inquire into the hours and conditions of work of asylum workers; and, if so, whether he would consider the advisability of giving representation to asylum workers on the Commission.—Mr. GREENWOOD (Parliamentary Secretary to the Ministry of Health) replied: It is not proposed to ask the Royal Commission to inquire into the hours and conditions of work of asylum workers. The Departmental Committee on the Nursing Service in Mental Hospitals which is now sitting will, I understand, report on the question of hours for nurses.

CASSEL HOSPITAL FOR FUNCTIONAL NERVOUS DISORDERS.—The second annual report of the Cassel Hospital for Functional Nervous Disorders deals only with those patients who were discharged during 1921 and 1922, in order that late results of treatment may not be ignored. During the period under review 95 patients were discharged from the hospital; since 13 of these were in the hospital twice, the report deals with 182 individuals. Of these 113 suffered from one or other form of psychoneurosis, 4 were drug addicts, 47 suffered from a psychosis, 13 from organic disease, and 5 were unclassified. Among the first group, 29 state that they are now quite well, and 56 are considerably better; 3 state that they are no better, but are at work; 4 are better, but do not attribute the improvement to treatment in this hospital; 15 report that they are no better, but of these cases it is said that none was ever very promising. The results in the other groups are reported with the same fairness and care, most of the information being given in tabular form. The great importance of taking the patient's history in minute detail is emphasised. Future reports from this excellent institution will be awaited with interest, since the method of making them serial by the addition of a further report on the cases dealt with in the previous year (in this case 1921) must add greatly to the value of the records.

Medical News.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.—An extraordinary Comitia of the College was held on May 8th, Sir Humphry Rolleston, the President, being in the chair. The gentlemen elected to the Fellowship at the last Comitia (THE LANCET, May 3rd, p. 930) were admitted as Fellows and gave their faith to the College.

Licences to practise physic were granted to the following candidates who had passed since the last Comitia:—

James Carver, Cork and London; Margaret Corner, London; Horatio A. Cowan, Univ. Coll.; Howard S. Edwards, St. Andrews and St. George's; Dorothy E. Galbraith, Royal Free; Hyman Hamilton, Cardiff and London; Richard F. L. Hewlett, King's Coll.; Violet E. M. Mizen, Doris E. O'Doherty, and Margaret Swete, Royal Free; Lewis J. Watkins, Cardiff and St. Thomas's; and Muriel M. Yates, St. Mary's.

Diplomas in Public Health were granted, jointly with the Royal College of Surgeons of England, to the following candidates:—

Joseph D. Benjafield, Victoria E. Brander, Bernard Broadbent, James A. Cruickshank, Donald Davidson, Eric Hardy, John Hughes, Leslie M. Jennings, Dattatraya Ganesh Kotibhaskar, George Macdonald, Balaram Harischandra Madan, John A. Manifold, Don Swithin Merl Emmanuel Perera, Douglas Reynolds, Margaret M. Sands, Harbans Singh, Victor A. T. Spong, Marjorie P. Taylor, Edith I. Thornley, Ernest W. Wade, Lionel E. H. Whitby, Samuel J. Woodall, and Caroline I. Wright.

After some discussion it was resolved that candidates for the Membership be informed that the languages are not compulsory, but that credit will be given to those who show knowledge in these subjects.—A letter was received from Prof. C. Achard notifying the College of a lecture to be given at the Académie de Médecine to celebrate the tercentenary of the birth of Sydenham and inviting the College to send a representative. The Treasurer was nominated.—It was left to the President to nominate a representative of the College at the Congress of the Royal Institute of Public Health to be held at Bordeaux.—A letter was read from Prof. K. F. Wenckebach returning thanks to the President and Fellows for his reception at the recent lecture given by him before the College.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—At an ordinary meeting of the Council of the College held on May 8th, Sir John Bland-Sutton, President, in the chair, Dr. Arthur Longley Whitehead, senior ophthalmic surgeon, General Infirmary, Leeds, was introduced, and after signing the by-laws was admitted a Fellow. Mr. John Howell Evans was introduced and was handed an honorarium, together with a certificate recording the Council's appreciation of the merits of his essay on the Pathology and Treatment of Malignant Diseases of the Testicle for the Jacksonian prize for 1923. Mr. William Warwick James was introduced and was handed the "John Tomes" prize, together with a document declaratory of the award, for his scientific work on the eruption of teeth, orthodontics, and the pathology of dental caries. Miss Pera Rosaline Cecilia Crawford, London School of Medicine for Women, having been introduced, signed the Roll of Begley Students, and received the first year's payment for her studentship, together with a document certifying her appointment as Begley student for three years.—Sir Cuthbert Wallace, K.C.M.G., surgeon to St. Thomas's Hospital, was re-elected a member of the Court of Examiners for a period of five years.

Diplomas of Member were conferred upon 169 candidates (137 men and 32 women) who have passed the requisite examinations and have complied with the by-laws of the College. The names and medical schools of the successful candidates were given in THE LANCET of May 10th (p. 979) with the exception of J. Carver, Cork and London, and Doris E. O'Doherty, Royal Free.

Diplomas in Public Health were conferred (conjointly with the Royal College of Physicians of London) upon 23 candidates.

The Licence in Dental Surgery was conferred upon Arthur Stuart Daniels, Guy's Hospital.

The Jacksonian prize, value £18 10s., will be awarded in 1924 for a dissertation on the Pathology, Diagnosis, and Treatment of Œsophageal Obstruction, and in 1925 for one on the Pathology and Treatment of Lymphadenoma (Hodgkin's disease). Candidates must be Fellows or Members of the College, not members of the Council. The number and importance of original facts will be considered principal points of excellence. The dissertations are to be delivered before the last day of the year, addressed to the Secretary at the College.

SOUTH LONDON HOSPITAL FOR WOMEN.—The new wing at the South London Hospital, South Side, Clapham Common, S.W., will be opened by the Duchess of York on May 22nd at 3.30 P.M.

TUBERCULOSIS SOCIETY.—An ordinary meeting of this society will be held to-day, Friday, May 16th, at the Margaret-street Hospital, Margaret-street, London, W., at 8 P.M., when Mr. Frank Kidd will read a paper on Tuberculosis of the Genito-Urinary Tract.

ROYAL SANITARY INSTITUTE. — The thirty-fifth Congress of the Institute will be held at Liverpool from July 14th to 19th. Lord Salisbury, as President of the Congress, will deliver his address at the inaugural meeting in the St. George's Hall on July 14th, at 8.30 P.M.

CHELSEA HOSPITAL FOR WOMEN.—A dinner will be given at the Mansion House on May 21st, the Lord Mayor presiding, to assist in raising the sum of £20,000 required by the hospital for the completion of a nurses' home, and to enable the council to open the "paying wards" at a very moderate charge. Donations may be sent to the Secretary at the hospital, Arthur-street, S.W. 3.

UNIVERSITY OF LONDON.—A public lecture on Sir Thomas Browne, Author of the Religio Medici: His Skull and Portraits, will be delivered by Miss M. Tildesley, research assistant, Royal College of Surgeons of England, on Tuesday, May 20th, at 5.30 P.M., in the Applied Statistics Theatre, University College (Gower-street entrance). The lecture, which will be illustrated by lantern slides, is open to the public without fee or ticket.

INTERNATIONAL SOCIETY OF PUBLIC HEALTH OFFICERS.—The provisional committee elected to draft the constitution and rules of this Society consists of Dr. Saimon (France), Dr. Grimani (Italy), Dr. Breger (Germany), Prof. Wladimiroff (Russia), Dr. Tubiasz (Poland), Dr. Pareja (Ecuador), with a representative of Great Britain to be nominated by the Society of Medical Officers of Health.

LONDON INTER-COLLEGIATE SCHOLARSHIPS BOARD. Six medical entrance scholarships and exhibitions of an aggregate total value of £630, tenable in the Faculty of Medical Sciences of University College and in the medical schools of University College Hospital, the London Hospital, and the London (Royal Free Hospital) School of Medicine for Women, will be offered. The examination will commence on June 24th. Full particulars and entry forms may be obtained from the Secretary of the Board, Mr. S. C. Ranner, M.A., the Medical School, King's College Hospital, Denmark Hill, London, S.E. 5.

THE annual dinner of the Federation of Medical and Allied Services has been postponed to Friday, June 20th, at 7.15 P.M., to suit the convenience of the Prime Minister and other official guests who will be present. The dinner will be at the Langham Hotel, London, and Sir Berkeley Moynihan, the President, will preside. The price of tickets is 12*s.* 6*d.* (exclusive of wine). Individual members and members of coöperating organisations are particularly requested to make early application for any tickets they may require for themselves or guests to the Secretary, Federation of Medical and Allied Services, 12, Stratford-place, London, W. 1.

COURSE OF MEDICAL HYDROLOGY AT BATH.—As part of a course conducted last week under the auspices of the University of London, a practical demonstration of balneological and allied treatments was given at Bath. The visitors, who arrived on Thursday afternoon, were divided into small groups under the guidance of Dr. F. G. Thomson, Dr. Rupert Waterhouse, and Dr. R. G. Gordon, and attended demonstrations of the throat and nasal sprays and the inhalation of the radio-active gas, Scottish and alternating douches, the vapour bath, and the local Bertholle bath. From the Queen's Baths the party went on to the Royal Bathing Establishment, where they were shown the local whirlpool treatment, the aeration bath, the Plombières douche, the Vichy douche-massage, deep and reclining baths with the various forms of undercurrent douching, the Bourbon Lancy douche for reducing high blood pressure, and the Aix douche-massage. At the Cross Bath a demonstration was given of voluntary and controlled movements in the treatment of spastic and flaccid paralysis. On Friday morning, at the Royal Mineral Water Hospital, Dr. Gordon demonstrated on Osteoarthritis and Spondylitis, Dr. Waterhouse on Fibrositis, Dr. Vincent Coates on Infective Arthritis and Gout, and a visit was paid to the biochemical and bacteriological laboratory under the guidance of Dr. J. M. H. Munro. The afternoon was again spent at the Royal Baths, the groups being in the charge of Dr. Charles Curd, Dr. Preston King, and Dr. Clulow Nixon, when demonstrations were given of electrical treatments of various kinds, including electrical hot-air baths, both whole body and local treatments, the radiant heat and light bath, and ionisation to be used either alone or in conjunction with various forms of heat treatment. The four-cell bath was shown, the Bristow coil, the ultra-violet ray lamp, the Bergonié treatment used in cases of obesity and certain other complaints, the high-frequency current, diathermy and arc-lamp treatment. Apparatus for mechano-therapy was shown in the Zander Department. Before leaving the members were shown over the Roman thermæ by the Director of the Baths, Mr. John Hatton. The visitors were entertained to tea by the Mayor of Bath on the first day, and by the local members of the medical profession on the second day. A dinner party given by the Baths Committee afforded an opportunity for a discussion on bathing facilities and their application.

CHELSEA CLINICAL SOCIETY.—The annual meeting will take place at the Club Room, St. George's Hospital, on Tuesday, May 20th, at 8 P.M., when officers will be elected for the session 1924–25. A discussion on the Treatment of Non-venereal Genito-urinary Diseases will be opened by Sir John Thomson-Walker.

PROPOSED MEMORIAL TO THE LATE SIR WILLIAM MACEWEN.—It is proposed to commemorate in some suitable manner the late Sir William Macewen, and a preliminary meeting to discuss the proposal will be held in the Hall of the Royal Faculty of Physicians and Surgeons, St. Vincent-street, Glasgow, on May 22nd, at 4.30 P.M. All members of the medical profession are invited to attend this meeting. Communications may be sent to Andrew Freeland Fergus, 14, Newton-place, Glasgow, or to Arch. Young, 5, Park-gardens, Glasgow.

THE LATE DR. G. B. EADIE. — George Balfour Eadie, M.D. Glasg., who died suddenly on May 8th, was one of the anæsthetists to the Victoria Infirmary, Glasgow. After obtaining his M.D. (with commendation) in 1905, it was his intention to specialise in diseases of the throat and nose, but during the war, while on service, he sustained so severe an injury to his hands as to prevent him from pursuing this course. On his return from service he took up the administration of anæsthetics. His skill and care soon brought him private practice, and his untimely death removes a popular figure from the Glasgow Faculty.

NURSES' COÖPERATION.—This Coöperation, which was founded in 1891 to secure to nurses full remuneration for their work, has just issued its thirty-third annual report, which records a continuance of prosperity during the year 1923. All candidates for membership must be State registered, and no nurse is admitted to the staff unless she holds a three years' certificate from a recognised training school and has had some experience in private nursing. The gross receipts from patients amounted to £49,073, of which sum £46,204 were paid to the nurses. Investments standing in the name of the Coöperation amounted to £3244. During the year under consideration there was much illness among the nurses and consequently a large demand for benefit from the sickness and benefit fund. The address of the Coöperation is 22, Langham-street, Portland-place, London, W.

MANCHESTER AND SALFORD: POOR-LAW HOSPITALS. Members of the board of guardians of the Manchester and Salford Poor-law hospitals are making strong protests with regard to Lord Knutsford's remarks in an address at a recent conference summoned by the Labour Party in London to discuss the "Hospital Problem." So far as these areas are concerned, they state, Lord Knutsford's allegations are entirely undeserved. In these hospitals—i.e., the Poor-law infirmaries—the patients receive treatment equal to that in the best public or private hospitals. Indeed, the Manchester Poor-law infirmaries deal with 1000 patients a month and in large industrial areas the Poor-law authorities spare no expense in maintaining these hospitals in the very highest state of efficiency. They have their own visiting surgeon, ophthalmologist, and other specialists as occasion requires. The old prejudice against Poor-law hospitals has gone. These hospitals are under the inspection of the Minister of Health. In Manchester many patients come to the hospitals of their own free will and pay for their treatment, and their number is steadily increasing. At a meeting of the Salford guardians held on May 9th the chairman said he felt it his duty to state that the Salford guardians had spared no pains in making Hope hospital a thoroughly efficient institution, where the patients could rely upon having at their disposal every requirement dictated by modern science. The true solution towards better organisation and coördination of the hospital systems lay not in State management and State control of the hospitals, but in a system of natural local development under the control of elected or selected individuals who were in close touch with local requirements. Poor-law hospitals were doing work of a standard that would bear comparison with the best that voluntary hospitals could show.

MATERNITY CENTRES: INFORMATION AS TO BIRTH CONTROL.—The Minister of Health recently received a deputation, introduced by Mr. F. A. Broad, M.P., on the subject of birth control. The deputation urged that the Minister should remove the embargo on the giving of information with regard to methods of birth control at maternity centres. In their opinion it was contrary to the whole policy of the Labour Party to deny working women access to knowledge which was readily available to people who could afford to pay for it. They also requested that the Minister should make it quite clear that doctors in the Public Health Service were free in their public capacity to give this information when they considered it medically advisable. The Minister, in reply, said that a clear distinction must be drawn between allowing access to knowledge and actually distributing knowledge. No one would seriously maintain that access to knowledge should be forbidden, but public opinion on this question was not so definite that it would allow State- and rate-aided institutions to do more than direct people in need of advice as to where it should be obtainable. The decision, in fact, must be with Parliament and not be assumed by administrative action. The speakers for the deputation included Mr. H. G. Wells, Mrs. Bertrand Russell, Dr. Frances Huxley, Mrs. Jenny Baker, and a statement was read from Dr. Sloan Chesser.

THE PEOPLE'S LEAGUE OF HEALTH.—The League is holding an International Health Conference at the British Empire Exhibition from May 21st to 24th inclusive. The subject of the Conference is the Latest Knowledge regarding the Causes, Treatment, and Prevention of Disease. Viscount Burnham will deliver the presidential address, and the Conference will be divided into seven sections, as follows: (1) Housing and House Sanitation, under the presidency of Mr. A. Neville Chamberlain, M.P.; (2) Food, under the presidency of Sir William Arbuthnot Lane, F.R.C.S.; (3) Air, Light, and Water under the presidency of Sir Henry Gauvain, M.R.C.S.; (4) Some Overseas and Other Diseases, under the presidency of Sir William Simpson, M.D.; (5) Mental Hygiene, under the presidency of Col. Sir Courtauld Thomson; (6) Industrial Hygiene, under the presidency of Prof. Sir Thomas Oliver, M.D.; (7) Legislation Desirable with Regard to Health Matters. On each day of the Conference the Tropical Health Exhibit in the British Government Pavilion will be demonstrated to the delegates. Further particulars may be had from the Hon. Organiser, 12, Stratford-place, W. 1, from whom nomination forms to the Conference may be obtained.

Medical Diary.

Information to be included in this column should reach us in proper form on Tuesday, and cannot appear if it reaches us later than the first post on Wednesday morning.

SOCIETIES.

THE ROYAL SOCIETY, Burlington House, W.
THURSDAY, May 22nd.—4.30 P.M., *Paper to be read:*—Prof. J. W. Gregory and C. J. Gregory: The Geology and Physical Geography of Chinese Tibet, and its Relations to the Mountain System of South-Eastern Asia. *Papers to be read in title only:*—Madge Kaye and Dorothy Jordan Lloyd: A Histological and Chemical Investigation of the Swelling of a Fibrous Tissue. (Communicated by Dr. R. H. Pickard.) C. H. Browning, Prof. J. B. Cohen, S. Ellingworth, and R. Gulbransen: The Antiseptic Action of Compounds of the Apocyanine, Carbocyanine, and Isocyanine Series. H. J. Watt: Dimensions of the Labyrinth Correlated. (Communicated by Prof. D. Noel Paton.)

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MEETINGS OF SECTIONS.

Tuesday, May 20th.

GENERAL MEETING OF FELLOWS: at 5 P.M.
Ballot for election to the Fellowship.

Wednesday, May 21st.

HISTORY OF MEDICINE: at 5 P.M.
Annual General Meeting:
Election of Officers and Council.
Papers:
Dr. Haldin D. Davis: History of Diseases of the Skin.
Prof. Charles G. Cumston: Remarks on a Lay Medical Tract: "The Duke's Desk Newly Broken Up," by William Lovell, Gentleman and Traveller, London, 1660.

Friday, May 23rd.

STUDY OF DISEASE IN CHILDREN: at 5 P.M. (Cases at 4.30 P.M.)
Annual General Meeting:
Election of Officers and Council.
Cases:
Dr. Stanley Wyard: Child of 13 suffering from Myelogenous Leukæmia.
Other cases will be shown.
Presidential Address:
Mr. R. H. Anglin Whitelocke: Posture in the Treatment of Disease.

EPIDEMIOLOGY AND STATE MEDICINE: at 8 P.M.
Annual General Meeting:
Election of Officers and Council.
Paper:
Dr. Louis W. Sambon: The Elucidation of Cancer.

Saturday, May 24th, and Sunday, May 25th.

BALNEOLOGY AND CLIMATOLOGY.
Annual Provincial Meeting:
At Buxton.

LONDON DERMATOLOGICAL SOCIETY, St. John's Hospital, Leicester-square, W.C.
WEDNESDAY, May 21st.—4.30 P.M., Discussion on Tertiary Syphilis with Special Reference to its Cutaneous Manifestations, to be opened by Colonel L. W. Harrison, followed by Dr. Alfred Piney, Dr. C.H. Mills, and others. Clinical cases will be shown by the staff of St. John's Hospital. After the meeting the Fellows and Guests will dine together at the Criterion Restaurant.

MEDICO-LEGAL SOCIETY.—A meeting will be held at 11, Chandos-street, London, W. 1, on Tuesday, May 20th, at 8.30 P.M., when Sir Lenthal Cheatle will read a paper on Wounds of Entrance and Wounds of Exit. To be followed by a discussion.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

FELLOWSHIP OF MEDICINE AND POST-GRADUATE MEDICAL ASSOCIATION, 1, Wimpole-street, W.
MONDAY, May 19th, to SATURDAY, May 24th.—CENTRAL LONDON THROAT, NOSE, AND EAR HOSPITAL. Special Intensive Course (second week).—THE INFANTS HOSPITAL. Mon., Tues., Wed., Thurs., 2–3 P.M., Clinical Instruction in the O.-P. Dept. Mon., 3 P.M., Dr. Noel O. Richards: Dem., Nursery Hygiene and Clothing. 4 P.M., Dr. Donald Paterson: Anæmias of Infancy. Tues., 3 P.M., Dr. Amy Hodgson: Dem., Diet from 1–5 years. 4 P.M., Dr. Bertram Shires: Diagnosis by X Rays. Wed., 3 P.M., Dr. Eric Pritchard: Dem., Dried Milk. 4 P.M., Dr. Donald Paterson: Vomiting. Thurs., 3 P.M., Dr. Eric Pritchard: Dem., Patent Foods. 4 P.M., Mr. M. S. Mayou: The Prophylaxis of Certain Eye Diseases, including Myopia and Cataract. Fri., 4 P.M., Mr. Tyrrell Gray: Pyloric Stenosis.—LONDON LOCK HOSPITAL. Clinical work daily. Lectures at Dean-street as follows. Tues., 2.30 P.M., Mr. McDonagh: Clinical Demonstration with Exhibition of Paintings. Wed., 5 P.M., Mr. Lindsay Rea: Interstitial Keratitis, Congenital and Acquired. Thurs., 2.30 P.M., Mr. W. Victor Corbett: Interpretations of the Wassermann Reaction. 4.30 P.M., Mr. Lawrence Abel: Some Complications of Gonorrhœa in the Male. Fri., 4 P.M., Mr. Johnston Abraham: Gonorrhœal Rheumatism.—MAUDSLEY HOSPITAL. Mon., 3.30 and 5.30 P.M., Dr. Bernard Hart: The Psychoneuroses. Tues., 2.30 P.M., Dr. F. C. Shrubsall: The Practical Aspect of Mental Deficiency. 4.30 P.M., Sir Frederick Mott: Brain Syphilis, its Symptomatology and Treatment. Wed., 2.30 P.M., Dr. Mapother: Dem. in Clinical Psychiatry.—PRINCE OF WALES'S GENERAL HOSPITAL. Special Course in Intensive Medicine and Surgery (first week).—ST. MARK'S HOSPITAL FOR DISEASES OF THE RECTUM. Operations, Clinical Demonstrations, and Lectures will be in progress during the day (second week).

WEST LONDON POST-GRADUATE COLLEGE, West London Hospital, Hammersmith, W.
MONDAY, May 19th.—12 noon, Mr. Simmonds: Demonstration of Fractures. 2 P.M., Mr. Simson: Diseases of Women. 4.15 P.M., Mr. Donald Armour: Lecture, Methods in the Diagnosis of Gall-stones.
TUESDAY.—11 A.M., Mr. Endean: Venereal Diseases. 12 noon, Dr. Burrell: Chest Cases. 2 P.M., Mr. Sinclair: Surgical Out-patients.
WEDNESDAY.—12.15 P.M., Dr. Burnford: Medical Pathology. 2 P.M., Dr. Pernet: Skin. Dept. 4.15 P.M., Dr. Owen: Lecture, Infantile Disorders in the First Ten Days of Life.
THURSDAY.—10 A.M., Dr. Grainger Stewart: Neurological Dept. 12 noon, Dr. Scott Pinchin: Diseases of the Heart. 2 P.M., Mr. Bishop Harman: Eye Dept.
FRIDAY.—10 A.M., Dr. Drummond Robinson: Gynæcological Operations. 12 noon, Surgical Registrar: Surgical Pathology. 2 P.M., Mr. Banks-Davis: Throat, Nose, and Ear Dept.
SATURDAY.—9.30 A.M., Dr. Burnford: Bacterial Therapy. 10 A.M., Dr. Saunders: Medical Diseases of Children. 10 A.M., Mr. Banks-Davis: Operations on Throat, Nose, and Ear.
Daily, 10 A.M. to 6 P.M., Saturdays, 10 A.M. to 1 P.M., In-patients, Out-patients, Operations, Special Departments.

NORTH-EAST LONDON POST-GRADUATE COLLEGE, Prince of Wales's General Hospital, Tottenham, N.
(At 4.30 P.M.)
MONDAY, May 19th.—Dr. W. Langdon Brown: Changing Standpoints in Metabolic Diseases.
TUESDAY.—Dr. F. G. Crookshank: Functional Hearts.
WEDNESDAY.—4 P.M., Mr. J. Howell Evans: Tumours of the Testicle.
THURSDAY.—Mr. J. Bright Banister: The Treatment of Contracted Pelvis.
FRIDAY.—Dr. L. R. Yealland: The Treatment of Neurosyphilis.

KING'S COLLEGE, Strand, W.C.
MONDAY, May 19th.—5.30 P.M., Prof. T. H. Brice, F.R.S.: The Development of the Human Embryo (University of London Advanced Lectures in Anatomy).
TUESDAY.—5.30 P.M., Last Lecture.

ST. JOHN'S HOSPITAL, Leicester-square, W.C.
TUESDAY, May 20th.—5 P.M., Dr. Wilfrid Fox: Nævi and Moles.
THURSDAY.—5 P.M., Dr. MacCormac: Rodent Ulcer.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, W.C.
THURSDAY, May 22nd.—4 P.M., Mr. Higgins: Demonstration of Surgical Cases.

ROYAL INSTITUTION OF GREAT BRITAIN, Albemarle-street, W.
TUESDAY, May 20th.—5.15 P.M., Prof. J. Barcroft: The Effects of Altitude on Man (Lecture IV.).
FRIDAY.—9 P.M., Dr. Andrew Balfour: Historical Aspects of Malaria.

UNIVERSITY OF LIVERPOOL POST-GRADUATE LECTURES. (At 3.30 P.M.)
MONDAY, May 19th.—(At the Hospital for Women.) Dr. Leith Murray: Leucorrhœa.
TUESDAY.—(At the Maternity Hospital.) Mr. Leyland Robinson: Albuminuria of Pregnancy.
WEDNESDAY.—(At the St. Paul's Eye Hospital.) Mr. Thos. Stevenson: Eye Cases.
THURSDAY.—(At the St. George's Hospital.) Dr. F. H. Barendt: Skin Cases.
FRIDAY.—(At the Eye and Ear Infirmary.) Dr. Hugh E. Jones: The Extracranial Complications of Infective Middle-Ear Disease.

BRISTOL UNIVERSITY POST-GRADUATE DEMONSTRATIONS.
WEDNESDAY, May 21st (at the Hereford General Hospital).—3.30 P.M., Mr. H. Chitty: Abdominal Surgery in Children.

MANCHESTER ROYAL INFIRMARY POST-GRADUATE LECTURES.
TUESDAY, May 20th.—4.15 P.M., Mr. J. Howson Ray: Varicose Veins.

Appointments.

CLAUSEN, R. J., M.B., B.S. Lond., has been appointed Anæsthetist to the Metropolitan Hospital, Kingsland-road, N.E.
RATNER, E., M.B., Ch.B. Manch., D.P.H., Assistant Tuberculosis Officer, Manchester.
STEPHENSON, G. E., M.B., B.S. Durh., Medical Officer of Newcastle Prison.
Charing Cross Hospital: BANISTER, J. B., M.D. Camb., F.R.C.S. Edin., Assistant Obstetric Physician; BROSTER, L. R., F.R.C.S. Eng., Assistant Surgeon; RICHARDS, W. A., M.B., B.S., Surgical Registrar; and YOUNG, F. H., M.B., Ch.B. Camb., M.R.C.P. Lond., Medical Registrar.
Certifying Surgeons under the Factory and Workshop Acts: YELL, W. L., M.B., Ch.B. Aberd. (Wartle); PRENTICE, J. S., M.B., Ch.B. Glasg. (Shap, Westmorland).

Vacancies.

For further information refer to the advertisement columns.

Belfast Municipal Sanatorium, Whiteabbey.—Res. Med. Supt. £750.
Bolton Infirmary and Dispensary—Res. Surg. O. £250. Two H.S.'s. £150. Asst. H.S. £100.
Bristol, Clifton Dispensary, Dowry-square. Res. M.O. £300.
Cambridge, Addenbrooke's Hospital.—H.S. £130.
Cambridgeshire Tuberculosis Colony.—H.P. £100.
Carlisle, Cumberland Infirmary.—Jun. H.S. £150.
Chelsea Hospital for Women, Arthur-street, S.W.—H.S. £120.
East London Hospital for Children and Dispensary for Women, Shadwell, E.—Clin. Asst. for Throat and Ear Dept.
Elizabeth Garrett Anderson Hospital, Euston-road, N.W.—P. for Mechano-Therapeutic Dept.
Exeter, Royal Devon and Exeter Hospital.—Hon. Anæsthetist and Hon. Asst. Anæsthetist.
Hampstead General and North-West London Hospital, Haverstock Hill, N.W.—Radiologist. £100.
Hospital for Sick Children, Great Ormond-street, W.C.—H.S. and H.P. Each £50.
Hospital for Women, Soho-square, W.—Res. M.O. £100.
Hull Royal Infirmary.—Cas. H.S. £130.
Kensington Tuberculosis Dispensary, 119, Ladbroke-grove, W.—Locum M.O. for one month. 35 guineas.
King Edward VII. Sanatorium, Midhurst, Sussex.—Med. Supt. £1000.
King's Lynn, West Norfolk and Lynn Hospital.—Res. Surg. O. £300.
Lancashire County Council.—Asst. County M.O. £800.
Leicester City Isolation Hospital and Sanatorium.—Asst. Res. M.O. £350.
Lichfield, County Mental Hospital, Burntwood.—Sen. Asst. M.O. £750.
Liverpool, Ministry of Pensions Hospital, Knotty Ash.—Consulting P. £300.
Liverpool, Royal Southern Hospital.—Hon. Gynæcologist and Hon. Asst. Orthop. S.
Manchester, Ancoats Hospital.—H.S. £100.
Manchester City.—M.O. £632 7s. 8d.
Mildmay Mission Hospital, Austin-street, Bethnal Green, E.—Sen. R.M.O. and Jun. R.M.O. £140 and £100 respectively.
National Hospital for the Paralysed and Epileptic, Queen-square, W.C.—Registrar. £200.
Newcastle-upon-Tyne, University of Durham College of Medicine.—Vacancy in Dept. of Bacteriology. £600.
Oldham County Borough Education Committee.—Asst. Schools M.O. £600.
Oxford, Radcliffe Infirmary and County Hospital.—H.S., Cas. H.S., and Res. Accoucheur. Each £120.
Preston, Lancs, County Mental Hospital, Whittingham.—Locum Tenens M.O. £8 8s. per week.
Queen Mary's Hospital for the East End, Stratford, E.—Hon. Asst. P.
Royal Waterloo Hospital for Children and Women, Waterloo-road, S.E.—H.P. and H.S. Each £100.
St. Bartholomew's Hospital, E.C.—Radiologist. Asst. M.O. to X Ray Dept.
St. Mary's Hospital, W.—Surg. Reg. £200.
Sheffield, Jessop Hospital for Women.—Asst. H.S. for Gynæcological and Maternity Depts. £100.
Sheffield Royal Infirmary.—H.P. £60.
Stoke-on-Trent, Longton Cottage Hospital.—H.S. £150.
Wakefield, Clayton Hospital.—H.S. £200.
West End Hospital for Nervous Diseases, Welbeck-street, W.—Locum Tenens for post of Half-time Pathologist. £300.
West London Hospital, Hammersmith-road, W.—Med. Reg. £100.
Whitelands Training College, Chelsea, S.W.—M.O.
Wolverhampton and Midland Counties Eye Infirmary.—H.S. £200.
The Chief Inspector of Factories, Home Office, London, S.W., announces a vacant appointment at Shepton Mallet, Somerset.

Births, Marriages, and Deaths.

BIRTHS.

DRUITT.—On May 7th, at North House, Petworth, Sussex, the wife of D. C. Druitt, M.R.C.S., L.R.C.P., of a son.
EDDISON.—On May 7th, in London, the wife of Dr. H. Wilfred Eddison, of a son.

DEATHS.

BARKER.—On May 9th, at Watford, suddenly, John Collier Barker, M.R.C.S., L.R.C.P., aged 62 years.
BATCHELOR.—On May 8th, in London, Charles Batchelor, M.R.C.S., L.R.C.P., of Fairfield-avenue, Staines, aged 61.
CUFFE.—On May 6th, at Johnstone-street, Bath, Edward Meade Cuffe, M.D., late Medical Officer at Wonford House, Exeter, only surviving son of the late Robert Cuffe, M.R.C.S., of Woodhall Spa.
FRASER.—On May 8th, James Alexander Fraser, M.R.C.S., L.R.C.P., of Western Lodge, Romford, Essex, in his 76th year.
SHATTOCK.—On May 11th, at Wimbledon, Samuel George Shattock, F.R.S., F.R.C.S., aged 71 years.
VICARS.—On May 4th, at Guy's Hospital, London, Frederic George Vicars, M.D., aged 63 years.
WILLES.—On May 7th, at Wellington-road, Bournemouth, William Willes, M.R.C.S., L.R.C.P., late of Greenwich, aged 69.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

ROYAL INSTITUTE OF PUBLIC HEALTH: CONGRESS IN BORDEAUX.—The Whitsuntide Congress, which meets at Bordeaux from June 4th–7th, will be divided as usual into a series of sections:—(1) State Medicine and Municipal Hygiene. Presidents: Sir Humphry Rolleston and Prof. C. Achard. (2) Naval, Military, and Air. Presidents: Vice-Admiral J. Chambers and Dr. Gérard, Ministre de la Marine. (3) Industrial Hygiene. Presidents: Sir Thomas Oliver and Prof. William Dubreilh. (4) Tropical Diseases. Presidents: Sir Ronald Ross and Prof. F. Mesnil, Institut Pasteur. (5) Pathology, Bacteriology, and Biochemistry. Presidents: Sir John Bland-Sutton and Prof. G. Mouriquand, Lyon. (6) Women and Public Health. Presidents: The Marchioness of Crewe and Mme. Wallerstein, Paris. These sections will meet concurrently on Thursday and Friday from 9 to 12 A.M. and 2 to 4.30 P.M., and on Saturday morning, the sectional presidential addresses being delivered at 9 A.M. on Thursday. The inaugural meeting of the Congress will be held at 2.30 P.M. on Wednesday in the Athénée Municipal, 53, rue des Trois Conils. Visits will be paid to the military exhibition arranged by the Ministry of War to the Port of Bordeaux and to other places of interest and beauty in the town and neighbourhood. The Congress dinner will be held on Friday evening in the Hôtel de Bordeaux. The London office of the Congress is 37, Russell-square, W.C. 1. The Bordeaux office is at the Faculty of Medicine, Place de la Victoire.

Notes, Comments, and Abstracts.

SOME SPAS OF SAVOY, THE DAUPHINY, AND THE JURA

THE spa season in these districts of France runs from May or June to September, and during the last few years the numbers of British visitors who seek there health and refreshment has steadily increased. Apart from the intrinsic value of these resorts, together with other natural and social resources for various conditions of ill-health, much has been done to popularise them by the Office Français du Tourisme,[1] in connexion with which there are organised yearly visits of medical men both from this country and elsewhere to inspect and sample the fare provided at the different centres. In THE LANCET of Feb. 9th, 1924, we referred to such a medical tour which took place last autumn, embracing the Jura, Savoy, and the Dauphiny. It is with the spas visited on that tour, in which 180 medical men took part, that the present article deals. The party assembled in Lyons, and after a short stay at Aix-les-Bains, which is too well known to require a special description, the following places were visited.

Challes-les-Eaux.

This spa is only 20 km. from Aix, and occupies a pretty and picturesque situation in the broad Chambéry valley at the foot of Mont St. Michel. Challes is remarkable for the strength and activity of its sulphur waters and specialises in the treatment of nose and throat troubles. It is in great favour with public speakers and professional singers, and the cure is also recommended for "lymphatic" children and for chronic bronchitics. The climate is cool and bracing in May, June, and September, and there are charming walks and endless interesting motor runs in the neighbourhood. Fast trains do the journey from Paris in about ten hours, and there is comfortable and unpretentious hotel accommodation.

Uriage.

The next spa to be visited was Uriage, which occupies one of the most beautiful sites in the French Alps, being surrounded by wooded heights which protect it from winds and give it the calm and peaceful characteristics of Alpine climates. The beginning and end of the season—i.e., June and September—are recommended as the best time to visit the station, as the bathing establishment is less crowded and the hotel prices more moderate. There are two springs, (1) an iron spring which contains bicarbonate of calcium and the sulphates of calcium and magnesia, and (2) a sulphur spring which has a constant temperature of 73° F. at the source, and contains hydro-sulphuric acid and a small proportion of sodium monosulphide. The waters, especially the gases which they contain, are regarded as radio-active in a high degree. The bathing establishment is modern and well-equipped. The Uriage waters claim to be highly tonic in their character, and are strongly recommended for neurasthenic conditions. They are useful for scrofulous children and congenital syphilis, and glandular diseases are much benefited by their use. The internal and external exhibition of the Uriage waters is attended by marked results in various skin diseases such as eczema, impetigo, lichen, psoriasis, and acne, but it is probably the treatment of syphilis by the Aachen method of rubbing, combined with the use of the sulphur springs, which chiefly commends the spa to British physicians. The Uriage water seems to facilitate the absorption and to aid the action of the mercury. Attached to the Pump Room is an extensive park, with a tennis club and a golf links. There are numerous hotels, and many of them are first class.

Allevard-les-Bains.

Situated at an altitude of 1172 feet in a charming valley in the midst of the Dauphiny Alps, is Allevard-les-Bains. Notwithstanding its surroundings, the station is remarkably free from the mists which are so frequent on Alpine slopes. The characteristic of the water is the presence of sulphuretted hydrogen, and the great specialty of the spa is cold inhalations in the form of a fine spray. The water is also employed as vapour baths and local douches, and a feature of the establishment is aromatic baths made from decoctions of soothing or sedative plants. The clinical indication of Allevard is diseases of the nose and throat, and, indeed, the spa unites many advantages—an agreeable climate, beautiful scenery and excursions, and a liberal supply of water remarkably rich in H_2S.

Brides-les-Bains and Salins Moutiers.

From Allevard it is only a two hours' run to the twin resorts of Brides-les-Bains and Salins Moutiers in Savoy. These are two health resorts situated in the heart of the "Tarentaise," a part of Savoy comparable in many ways with the most beautiful parts of Switzerland. Salins is situated at an altitude of 1500 feet and a distance of one mile from Moutiers, and Brides at an altitude of 1800 feet two miles further on.

The waters of Brides and Salins each have their particular properties, but their combined employment often gives excellent therapeutic results. Brides is the French rival of Carlsbad and Marienbad, and its situation at the confluence of two mountain torrents tends to produce a tonic and bracing climate. The Brides water comes from a thermal spring at a temperature of 95° F., and its action is laxative, tonic, and diuretic. Its essential contents are sulphate of sodium, sulphate of magnesium, chloride of sodium, and sulphate of calcium. The principal indications for the Brides water are obesity and hepatic complaints and gastro-intestinal diseases, especially constipation with intestinal atony.

The cure at Brides is recommended for what the French love to call lymphatic children, and for convalescents from exhausting diseases, such as malaria. Local douches, maintained at a constant temperature by an automatic apparatus, are also used in the treatment of various gynæcological conditions, such as metritis and leucorrhœa.

Salins Moutiers is the French rival of Nauheim and Kissingen, and has been called the Thermal Sea of the Alps as its enormous yield of water (six million litres a day) permits its use as running water in both swimming and private baths. The temperature of the spring is 95° F., and its essential contents are chloride of sodium (12½ g. per litre), carbonate of iron, arsenate of sodium, carbonic acid, and what, for want of a more exact term, are described as radio-active substances.

These two charming resorts seem to be peculiarly adapted for Anglo-Indians, and the type of patient from tropical parts of our Empire who, before the war, used to flock to Carlsbad and Kissingen.

Fayet St. Gervais.

The spa is situated on slopes rising to an altitude of 1968 to 2788 feet on both banks of the river Bonnant, and Mont Blanc raises its snowy peak in the near distance. All the characters of a well-sheltered mountain climate are found. The town has an excellent water-supply of great purity, and all the amenities which an efficient municipal administration can provide. The springs and the bathing establishments are at Le Fayet, and there are three sources: (1) the Gontard; (2) the de Mey, both saline springs; and (3) the Guéridaud, a sulphur spring. The saline waters are at a temperature of about 101° F., and contain 5 g. of solids to the litre, the salts consist of sulphates of calcium soda and lithia, various bromides, silicate of sodium, and it is claimed that they are the most highly lithiated waters in Europe. The Guéridaud Spring also contains small quantities of hydrogen sulphide and of glairin. The St. Gervais waters are indicated in various arthritic troubles, more especially in those cases which are associated with hepatic, asthmatic, and cutaneous manifestations. The Guéridaud spring permits of its employment in the treatment of chronic skin diseases, where a most highly sulphurated water would be contra-indicated, and it is also, like other sulphur waters, used with benefit in various forms of rhino-pharyngitis. The climate of the spa is both soft and bracing, and a stay at St. Gervais often gives excellent results in neurasthenic conditions, and its bath appears to exercise a direct sedative action upon the glandular elements in delicate and nervous children who appear to thrive in this charming valley. Taken by the mouth the waters are diuretic, and mildly laxative and depurative.

St. Gervais is just 12 hours on the direct line from Paris, and the starting point of the Chamonix Martigny railway and of the funicular to Mont Blanc, so that apart from the local attractions of a fine park and numerous delightful walks, it is a splendid centre for excursions into the most interesting parts of the French and Swiss Alps.

Evian.

Evian is one of the principal towns of the Savoy, picturesquely situated on the slopes of the hills rising from the French shores of the Lake of Geneva. It nestles in a sort of amphitheatre which shelters it from high winds, and is kept cool in summer by the fresh breezes blowing from the mountains to the lake. The local *corps médical* consider that the spa owes much to its agreeable climate, which is tranquil without being relaxing, and produces very beneficial effects in various pathological conditions associated with nervous irritability or excitement. The springs of Evian are divided into several different groups, the principal one of which includes the celebrated Cachat Source, which is a cold, non-gaseous but highly agreeable water; it is only weakly mineralised, as it contains less than half a gramme of alkaline carbonates to the litre. The cure depends on the highly diuretic action of the

[1] Office Français du Tourisme: Services des Stations Thermales, 56, Haymarket, London, S.W. 1.

water, which is taken in the morning fasting and between meals. The volume of urine passed after drinking the water often exceeds to a remarkable degree the amount of fluid ingested, and it is on this flushing of the intestinal and urinary passages that the treatment depends. All patients are advised to drink the water in the horizontal position, and to remain lying down for an hour or two afterwards to encourage diuresis. The Cachat water is delivered at the hotel in charming stone containers to enable clients to carry out the treatment with the minimum of discomfort. The clinical indications for a visit to Evian are numerous, but gout in its many manifestations, perhaps, stands at the head of the list. Next in importance are genito-urinary disorders where benefit may be expected from a careful régime, and diuresis promoted by a pure and efficient mineral water. Some forms of dyspepsia and colitis, especially when accompanied by diarrhœa, and a large range of hepatic conditions where the more drastic cure at Vichy is likely to be badly borne, do well at Evian. Neurasthenics and children and adolescents of neuro-arthritic parents who respond badly to home treatment are often "cured" by a course at Evian; whilst the station specially caters for what the French politely term "plethoric gourmands," with whom supervision of the dietary and a thorough "washing out" by the waters yield excellent results in reducing weight and arterial tension. Evian is essentially a gay and fashionable spa and is resorted to annually by *le monde chic* of all Europe. It has fine hotels to which access from the lake side, where the casino is situated, is provided by a funicular service. Besides the magnificent Pump Rooms of the Cachat Source, there are a number of subsidiary establishments on the borders of the lake, and inland surrounded by the fine chestnut trees for which the district is famous, where the fashionable crowds can be readily avoided.

Divonne-les-Bains.

The Jura mountains are much less imposing than the Alps, but have a charm all their own. Divonne is situated on their eastern slopes, overlooking the plain and Lake of Geneva. Its altitude is 1685 feet, and it enjoys an equable and sunny mountain climate which enables it to keep open all the year round. The spa is in some ways unique, as its waters are neither warm nor mineralised; *au contraire*, the springs maintain a temperature of 43° F. all the year round and contain no mineral salts. The bathing establishment is well organised, and hydrotherapy is associated with various other forms of treatment, including heliotherapy and psychotherapy. Divonne specialises in the treatment of various nervous conditions including genital weakness, and the peace and quiet of the surrounding country render it well adapted for rest cures. There is a good first-class hotel, and several others less pretentious, and its position makes it an excellent centre for excursions in the summer, while ski-ing and tobogganing are to be obtained during the winter on the neighbouring mountain slopes.

Salins-du-Jura.

Salins-du-Jura lies in a pretty valley, and is somewhat unique as its waters are only used externally. The springs are so rich in chlorides, and especially sodium chloride, that they are used commercially for the manufacture of common salt. The water is used both before and after the commercial process. After the extraction of the chloride of sodium, an oily, yellowish fluid is left which is styled the *Eaux Mères*, and is employed by itself for compresses and douches, or used to reinforce the spring water. The chief therapeutic indications for the Salins cure are various forms of surgical tuberculosis and some gynæcological conditions, such as metritis. There is no first-class hotel, but for visitors with modest tastes there is ample second and third-class accommodation.

Besançon.

The last spa to be visited was Besançon. La Mouillère is a sort of suburb separated from the town by the river Doubs and the Micaud road. The springs of Besançon, a fine town with numerous industries and a medical faculty of its own, are situated about three miles outside the town, and the water is piped into a centrally situated thermal establishment. The springs are saline in character, the chief constituent being common salt, but there are marked traces of bromides and iodides. Besançon specialises in children's diseases, and claims to be particularly suited for delicate children when there are contra-indications to sea air. The spa is also recommended for a long list of gynæcological conditions, including habitual abortion and sterility. There are two excellent establishments on the surrounding mountain slopes, where children who cannot be accompanied by their parents are treated. The children receive the cure at the baths and are given graduated exercises and a form of open air treatment under charming climatic conditions. Besançon offers all the amenities of life in a fine old French town, and there are numerous walks and endless excursions into the picturesque Jura.

TWO IMPORTANT HEALTH REPORTS.

(1) NORTH-WEST FRONTIER PROVINCE, INDIA.

THE population of this Frontier Province in 1921 was found to be 2,135,573; the trans-border tribal tracts are not included in this figure, census enumeration not being practicable; "the present agent, the chaukidar, is the best obtainable at the price, and a better cannot be substituted without an enormous increase in cost. Such a reform is outside practical politics at the present time." The birth-rate was 23·7, as compared with 28·6, the average for the five years, 1917–21; the actual decrease in numbers was greatest in Hazara district, where the births recorded were only 11,552, compared with 17,793, the average for 1917–21. Lieut.-Colonel William Anderson, I.M.S., Chief Medical Officer and Director of Public Health, who presents this report,[1] considers that the decrease in notified births in 1922 (10,349, as compared with the quinquennial average of 61,090) may be due to "the unfavourable effect of the actual scarcity which existed in 1921, and of the very general prevalence of malaria in that year that still continued." The birth ratios varied from 19·7 per 1000 in Hazara district to 29·9 in Dera Ismail Khan. The infantile mortality was 151·5 per 1000 births, a considerable improvement on the quinquennial average of 191·9; in the other provinces of India the ratio varied from 139·91 in Bihar and Orissa to 228·73 in the Central Provinces, the Frontier Province showing a lower ratio than any other except Bihar and Orissa.

Death-rates and Conservancy.

The general death-rate (21·7, as compared with 35·4, the mean ratio for the quinquennium 1917–21) showed a great improvement. This was chiefly due to the decline in influenza and malaria; the ratio was lower than in any other province in India, Punjab coming next (22·07), and Central Provinces having the highest ratio (29·31). In the rural circles, embracing the greater portion (1,923,148) of the population, the mortality ratio was 21·26 per 1000, as compared with 35·57, the quinquennial average; in the towns the respective ratios were 25·55 and 33·94; there was, therefore, a great improvement all round, but most marked in the dwellers in the country. Among the Indian non-military population (32,902) living in cantonments the mortality was only 8 per 1000; for the majority (17,003) living in Peshawar cantonment the ratio was only 1·58. A striking tribute to the efficiency of cantonment sanitation and standard of living is afforded by these figures. For Peshawar district as a whole the mortality was 18·8; for the rural circles 17·16, and for the city 33·67 per 1000; yet among the same (or a similar) class of population living in the cantonments the death-rate was only 2, or more exactly 1·58, per 1000. Lieut.-Colonel Anderson states that the high mortality in Peshawar city "is directly traceable to the very unsatisfactory conservancy arrangements which exist. Not only are the collection and transport arrangements defective, but the method of disposal results in the breeding of millions of flies in close proximity to the city walls. A great deal of the sickness which prevails is preventable, and as the Peshawar municipality has the necessary funds at its disposal its apathy in taking steps to improve its conservancy arrangements is lamentable. At Abbottabad, where the conservancy arrangements are the best in the province, the death-rate was least—namely, 11·01, less than one-third of that in Peshawar. The other three towns in Hazara district where sanitary arrangements are very defective [Nawanshar, Baffa, Haripur] have a higher death-rate [34·76, 25·78, 32·09 respectively] than any other towns in the province, excluding Peshawar. These facts speak for themselves."

Epidemic Disease.

The province was exceptionally free from epidemic disease during the year reported on. Cholera caused 92 deaths (0·04 per 1000, as compared with 0·81 per 1000 for the previous five years); of the total 129 cases 69, with 53 deaths, occurred in Peshawar city (giving a mortality ratio of 0·67 per 1000), and four deaths were reported in the adjoining Becketganj-Khawjaganj "notified area." The health officer considered that in all the Peshawar cases the exciting cause was unripe or over-ripe fruit; experiments by Lieut.-Colonel F. P. Mackie, I.M.S., showed that cholera vibrios could be recovered from the interior of melons injected seven days previously, and from tomatoes and cucumbers injected three days previously. He emphasised the necessity for avoiding any damaged or bruised fruit during the prevalence of cholera. Anticholera inoculation was carried out, with a total of 1266 cases. Small-pox caused only 104 deaths, the quinquennial average having been 800; the mortality ratios were 0·05 and 0·37 respectively; in the rural circles the ratio was 0·02, Hazara and Bannu being quite free; in the towns the ratio was 0·34 and

[1] Peshawar: N.W. Frontier Province Govt. Press, 1923.

at Peshawar there were 54 deaths (0·68 per 1000); nothing is stated as to the condition of these cases, whether vaccinated or not. There was a definite decrease in fever mortality in all the "settled districts" throughout the province, the deaths registered from this cause numbering 39,984, as compared with the five-year average of 63,846; in Bannu district the ratio was only 14·22; in Hazara it was 23·25; for the whole province 18·72 per 1000. Relapsing fever had not been returned separately in previous years; in 1922 401 cases with 205 deaths were recorded in Peshawar, Kohat, and Dera Ismail Khan districts, the spirochæte being found microscopically in the blood; "as the great majority of the rural population are lice-infected, the extension of relapsing fever is easily explained. It is probably imported by Powindahs, who come across the borders in large numbers during the cold weather. They are invariably verminous and extremely insanitary in their habits." Plague prevailed in Peshawar city and to a slight extent in the district from May to July inclusive; the total cases during the year numbered 204, with 123 deaths (0·1 per 1000); in Peshawar city there were 188 cases and 115 deaths, the remainder occurring in the neighbouring villages. There was also one case (fatal) at Kohat. Out of 8404 rats examined 47 were found to be infected; 212 rat fleas captured in Peshawar and examined at the Kasauli Institute were all found to be *Xenopsylla cheopis*. "Since their appointment in 1913 the cost of maintenance of health officers has been met from provincial revenues. This year, owing to the need for retrenchment the local government decided that this expenditure should be borne by the local bodies for whom the health officers work." Peshawar and Dera Ismail Khan have agreed to this arrangement; "the other municipalities have agreed to pay a monthly allowance to a local assistant or subassistant surgeon in Government employ to do the work of a health officer in addition to his other duties." The responsibility for necessary public health investigation and action must nevertheless remain with the Provincial Government.

A large and increasing amount of work has been done in the provincial bacteriological laboratory under Assistant-Surgeon H. D'Silva; 10,244 pathological specimens were examined during the year, and much interesting research carried out in connexion with autogenous vaccines, which were tried in 55 cases with marked success. Lieut.-Colonel Anderson concludes his report with the remark that "there might be much more progress if deputy commissioners would, to a greater extent, take a personal interest in the carrying out of measures recommended by the public health authorities." This is quite true, and happily it is frequently, if not generally, the case that these officers do take such an interest; if this is not so the public health is likely to suffer, and the responsibility for this would undoubtedly lie, in a greater or less degree, with the executive authority.

Hospitals and Dispensaries.[2]

The report on Hospitals and Dispensaries in the North-West Frontier Province for 1922 deals with the working of 80 medical institutions. Owing to the need for financial retrenchment seven dispensaries had to be closed, while three new dispensaries were opened for the South Waziristan and Tochi Scouts. These institutions are divided into three groups, in the first of which, comprising what are known as "State Public, Local Fund, and Private-aided" hospitals and dispensaries, 47 in number, a total of 12,792 in-patients and 798,479 out-patients were treated, as compared with 11,434 and 719,537, the averages of the preceding quinquennium. The daily average of in-patients was 486 and of out-patients 3509, as compared with 421 and 3367 for the quinquennium. The year was exceptionally healthy in this province, the mortality among the general population being only 21·7, compared with 35·4 per 1000, the quinquennial average. Malaria was much less prevalent than usual. "It has been found that an increase of malaria occurs about a fortnight after the minimum wet bulb thermometer reaches 18° to 22° C. It is only between these temperatures that the malarial parasite exists in the circulation in a form that is undergoing further development in the mosquito and so being spread." In Peshawar such a temperature range prevails from the last week in April to the first week in June, and from the second week in September to the first week in October. Malaria in this province occurs especially in May and June and in the autumn. Cinchona febrifuge, costing less than a third of the price of quinine, has been found by Major H. W. Acton, I.M.S., and other observers to give a higher percentage of cures than quinine, and has been largely used with very good results. Only two cases of cholera were admitted to hospital, and ten treated at their homes. A small outbreak of plague occurred in Peshawar district, 14 cases being treated at their homes; no death is recorded.

[2] Peshawar Government Press, 1923.

In the second group, "State Special" hospitals, including those for police, frontier constabulary, militia and scouts, canals and railways, numbering 28, there were 162,766 patients under treatment, a large increase on the quinquennial average of 118,803; this was due to the opening of three railway construction hospitals in the Khyber in 1921, and to the great increase in the strength of the Tochi and South Waziristan Scouts. The third group, "Private non-aided" institutions, consists of the Mission Hospitals at Peshawar, Dera Ismail Khan, and Karak, the Zenana Mission at Mardan, and the Victoria Diamond Jubilee Hospital at Peshawar; in all 43,027 patients were treated, indoor and outdoor. The term "dispensary" is used for what would be correctly be called "hospital," as in-patients are included in the numbers stated. Lieut.-Colonel Anderson, in reviewing the year's work, notes that on the whole the year was exceptionally healthy, and regrets that need for retrenchment necessitated a reduction of four in the number of dispensaries maintained, and of 14 in the cadre of sub-assistant surgeons. Nevertheless the hospital attendances were more than 116,000 in excess of the quinquennial average and the operations performed increased by nearly 5000, this being "a reliable criterion of the popularity and utility of a hospital."

Jails.

In the jails and judicial "lock-ups" of the Frontier Province the total prisoners of all classes confined in 1922 numbered 13,494, as compared with 12,271, the quinquennial average for 1917–21; and the daily average prison population was 3424, against 2929 in the preceding year. Serious overcrowding existed in all jails and lock-ups, on account of transfer to the Andaman Islands being stopped, and the number sent to other provinces greatly reduced. Owing to this large numbers of prisoners sentenced to labour could not be employed for lack of factory accommodation, as many as 400 such being idle in Peshawar jail at one time; nevertheless the cash profits amounted to Rs.52,649, and the earnings per head of those employed in the manufactories to Rs.121.9.0, as compared with Rs.24,597 and Rs.56.6.0, the quinquennial averages for 1917–21. "The object of the jail department is to obtain a regular market for the articles it manufactures. . . . Larger and regular orders from public consuming departments are required." The overcrowding occurred only among male prisoners, their daily average numbering 3257, while the total accommodation was for 2509 only; the excess number were kept at night in tents and worksheds. The total admissions to hospital numbered 4351, giving a ratio of 1370 per 1000 of average strength; for the quinquennium, 1917–21, the figure 2172 is stated both as the number and as the ratio per 1000 of hospital admissions—an obvious error, for the correction of which figures are not available in the report. The average constantly sick rate for 1922 was 40, and mortality 26·45 per 1000; "on the whole, the health of the prisoners was good. Of the 72 prisoners who died, 51 had been in prison for less than one year." (Page 13.) On the same page, however, and in Statement No. XIV., p. xxxvii., the total deaths are stated as 84 (including one female); the number 72 refers to male convicts only. Malaria was prevalent in Peshawar jail, but of a mild type. Of 1626 admissions to hospital only two cases proved fatal, and these were complicated with cirrhosis of the liver and dysentery respectively. Out of 1450 prisoners examined in this jail 107 had enlarged spleen. Dysentery, so frequently a jail scourge, caused only 32 admissions and 2·22 deaths per 1000 average strength among the convicts; at Abbottabad these ratios were 74 and 12·34 respectively. Not a single case of cholera occurred in any jail throughout the year. Lastly, of the 2960 convicts discharged during the year 44·8 per cent. had gained, and 26·5 per cent. lost in weight, a satisfactory testimony to the general health arrangements of the jails, though not equal to the quinquennial average results (1917–21), which showed a gain in 51·5 and a loss in 23·3 per cent. Lieut.-Colonel Anderson concludes his report [3] by emphasising the urgent need for a central jail, and an increase in the staff of warders; chronic overcrowding and lack of factory accommodation are also conditions needing immediate attention.

[3] Administration Report on Jails, N.W. Frontier Province, 1922, Peshawar Government Press, 1923.

(2) PUBLIC HEALTH IN TANGANYIKA.

THIS territory consists of that portion of the former colony of German East Africa which, under the Treaty of Peace, the principal Allied and Associated Powers agreed should be administered under a mandate by His Britannic Majesty. The territory extends from the Umba River on the north, to the Rovuma River on the south, the coast line being about 500 miles in length, and includes the adjacent islands; the total area is about 365,000 square miles. The seat of

government is Dar-es-Salaam (population approximately 25,000). Portions of the great lakes of Central Africa are included in the territory—viz., the southern portion of Lake Victoria, the eastern shores of Lake Tanganyika, and the northern and north-eastern shores of Lake Nyasa; there are four smaller lakes and numerous rivers. The highest points in the territory are in the north-east, where are the extinct volcanoes, Kilimanjaro, which rises to 19,720 feet, and is snow-capped, and Mount Meru (14,960 feet); in the south-west are the Livingstone mountains, where the highest peak is over 9000 feet. The system of administration is to support and supervise, with the least possible interference, the native authority as existing or established. The population, as shown by the census taken in 1921, was: Europeans, 2447, of whom 1598 were British subjects; Asiatics, 11,991; and natives, 4,107,000. No statistics relating to native births and deaths are available. The population of the up-country districts is almost certainly increasing, but the birth-rate on the coast is low. The sterility of the Swahili women is due to immorality, and, to some extent, probably, in-breeding.

Superstitions and Habits.

The official report for 1922 records that an Ordinance making witchcraft a punishable offence has been passed to check the activities of the medicine men. To the influence of these may be attributed the barbarous practice of infanticide, which prevails among the Wapare in Moshi district. Children born with some abnormality or considered by the diviners to be unlucky for a great diversity of reasons, such as the cutting of the lower before the upper teeth, or the offspring of parents who have failed to undergo initiation into certain tribal ceremonies, are done to death by deliberate starvation and neglect, suffocation, poisoning, or injury at birth, or, if a less obvious method is required, by exposure to the unhealthy climate of the low country. In general, the parents would not of their own accord abandon such children, and in many cases have preferred to give them away to strangers, but they are more or less compelled by popular opinion, or by the fear of incurring blame for any general misfortune that may befall the community, such as a drought or epidemic. Fermented liquor is manufactured by natives from various materials, such as the cocoanut palm, honey, grain, &c., and its consumption at most native ceremonies is demanded by tribal custom. While its sale in townships can be controlled, prohibition or restriction in the villages is well-nigh impossible. Taken in moderation, native beer is a harmless concoction, and is part of the daily food ration of the old men, but over-indulgence in it leads to quarrels, and is responsible for the majority of crimes of violence. The chiefs are empowered to prevent the supply of liquor to young persons, and to restrict drinking bouts. Natives in the Mwanza district were discovered distilling a potent form of spirit from bananas on Ukerewe Island, whence it was carried by canoe to the mainland and thence retailed; the culprits were brought to justice. A cottage hospital was opened at Moshi, and a European ward added to the Mwanza hospital, nursing sisters being posted to each of these districts. A block of the Tanga hospital was converted for the reception of Asiatics, and the accommodation at the native hospitals at Dar-es-Salaam and Iringa was enlarged. During the year 12,400 native in-patients and 97,700 out-patients were treated in Government hospitals, at which a medical officer or sub-assistant surgeon was stationed. In many of the sub-districts, where no regular medical establishment exists, minor ailments were attended to by Indian compounders or native dressers. Appreciation by the native of the value of medical aid increases, but the innate conservatism of the unsophisticated often keeps them from presenting themselves for treatment until their own medicines have failed, and the disease has made headway. Praises must be given to the missions, which perform a great deal of excellent work, and in many cases include qualified doctors or nurses among their staffs.

Infectious Disease, Endemic and Epidemic.

Of infectious diseases plague, small-pox, and cerebro-spinal fever are endemic in the territory. In the Singida sub-district of Dodoma, where plague has certainly existed since 1918, there were 23 deaths from the disease, as against 149 in 1921. Following the return of a native from that area to his home, a disease which was almost certainly plague was reported at Shinyanga in the Tabora district; 13 deaths occurred, but prompt measures were taken, and no recrudescence has been recorded; 46 deaths from small-pox were notified from various districts. Vaccinations steadily proceed, and 178,750 doses of lymph were prepared in the laboratory and distributed. An outbreak of sleeping sickness in the Mwanza district caused grave anxiety during the year. This epidemic has been proved to be due to infection with *Trypanosoma rhodesiense*, the vector being a tsetse of the morsitans group. This occurrence of the Rhodesian form of sleeping sickness many hundreds of miles north of any previous recorded outbreak is ominous, as very large areas of the territory and neighbouring countries are infested with *Glossina morsitans*, and a generalised infection of tsetse throughout these areas would be disastrous. Fortunately this epidemic occurred in an isolated flybelt, and the energetic measures instituted since the disease was discovered appear to have been successful in controlling the outbreak. The natives have been removed to fly-free areas, and the patients and suspected cases segregated in isolation camps, where 41 remained at the end of the year. There is no doubt that the disease had been present in the area for three or four years, and was responsible for several hundred deaths which the natives had attributed to some form of elephantiasis. Venereal disease is very common in the larger towns, and reports indicate that the Mwanza and Bukoba districts are heavily infected. Syphilis is responsible for a large percentage of the heavy infantile mortality, and to an even greater extent for reduction in the birth-rate. The more progressive chiefs are aware of the dangers, and, in some districts, are encouraging infected persons to go into hospital, while the tribal courts in Dodoma have started to impose a fine of ten head of cattle on any man found proved to have communicated the disease. Most districts are malarious, and the spirillum tick is widespread in certain areas.

A Variety of Climates.

The climate varies greatly, according to the height above sea-level. Roughly, four climatic zones can be distinguished (though even among these there are considerable local variations), viz.: (1) The warm and rather damp coast region, with its adjoining hinterland; here conditions are tropical, though not unpleasant except just before and during the rainy seasons when the heat is trying and the atmosphere humid; the average yearly temperature is 78° F. (2) The hot and moderately dry zone between the coast and the central plateau; this is characterised by low humidity of atmosphere, less rain, and a temperature rather lower, but with greater daily and yearly variations. (3) The hot and dry zone of the central plateaus between 2000 feet and 4000 feet in height; the prevailing characteristics are low humidity, little rainfall, and a fairly high mean temperature; the heat is dry, but not so trying to the European as the moist and steamy warmth of the coast, while the nights are invariably cool. (4) The semi-temperate regions around the slopes of Kilimanjaro and Meru, of the Usambara highlands, the Ufipa plateau, and the mountainous areas of the south-west (5000 feet to 10,000 feet); frosts occur at the higher altitudes, and the nights are cold; these districts enjoy a bracing climate, and alone can be considered healthy for Europeans, but prolonged residence in these altitudes is apt to produce nervous strain, even though physical fitness is maintained. There are two well-defined rainy seasons annually. Generally speaking, the long rains begin in February or March, and last for two or three months, while the short rainy season is in October to November, but the rainfall is low for a tropical country, and droughts are not infrequent.

THE PUBLIC SCHOOLS YEAR BOOK.[1]

THE Public Schools Year Book for 1924 is the thirty-fifth of the annual series. It is described as a comprehensive guide to public and preparatory schools, universities, professions, all public services throughout the Empire, and business careers, and indeed bears out the claims made for it. It is to the short article on the medical profession that we naturally turn; the object of this article is to outline to the intending student what steps he should take to ascertain the different methods of entering our profession, and also to give him some idea of the various careers that are open to him, after he has obtained his qualifications. The information given appears to be accurate and the advice sound as far as it goes; for further details the prospective student is referred to the Students' Number of THE LANCET. The medical scholarships obtainable at various institutions are set out clearly in tabular form. Parents who wish to choose schools, universities, or professions for their sons cannot do better than consult this manual.

[1] Edited by C. H. Deane, *M.C.*, B.A.; A. P. W. Deane, B.A.; and W. A. Bulkeley Evans, M.A., O.B.E. 1924. London: H. F. W. Deane and Co., The Year Book Press, Ltd. Pp. 832. 10*s.* 6*d.*

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